TECHNOLOGY DEPARTMENT

ROADS AND STREETS

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Contractors say
ROCK DRILLING
COSTS ARE LESS WITH
Timken Bits

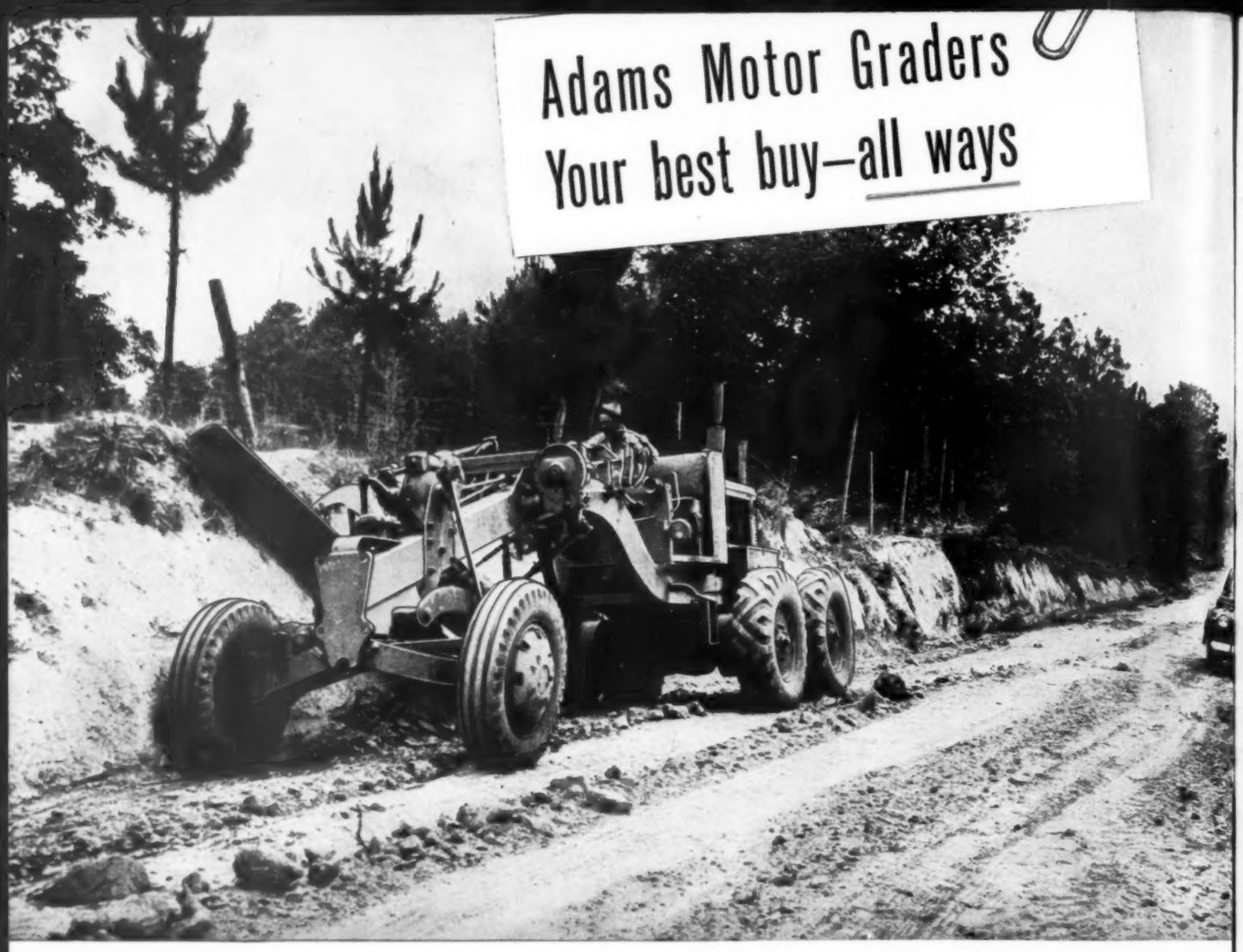
Any contractor who has had any appreciable experience with Timken Rock Bits will tell you that his rock moving costs are considerably lower than they used to be.

That's because Timken Bits drill faster; yield more footage per bit; can be reconditioned several times for additional service life; drastically cut steel costs; save the drillers' time.

These advantages spring from a combinaton of design, material and manufacturing technique that cannot be duplicated. No other bit manufacturer makes his own steel. No other bit manufacturer has the benefit of such far-reaching metallurgical knowledge and experience.

If you've never used Timken Bits you don't know what you're losing. Write for name of nearest authorized distributor. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROCK BITS



Ditch Cuts to Bank Cuts

IN JUST 45 SECONDS

● Yes, 45 seconds does it with an Adams Motor Grader. Using only Adams power-operated cab controls, you shift from deep ditch cuts to high bank cuts (or vice versa) in just 45 seconds—*with blade centered on circle—without changing "average" setting of telescopic blade lift links.*

This important Adams advantage means that the operator obtains virtually any desired blade position right from the cab—*without leaving his seat—without stopping the grader.* The result is faster work—more accurate and satisfactory work . . . *at lower cost.*

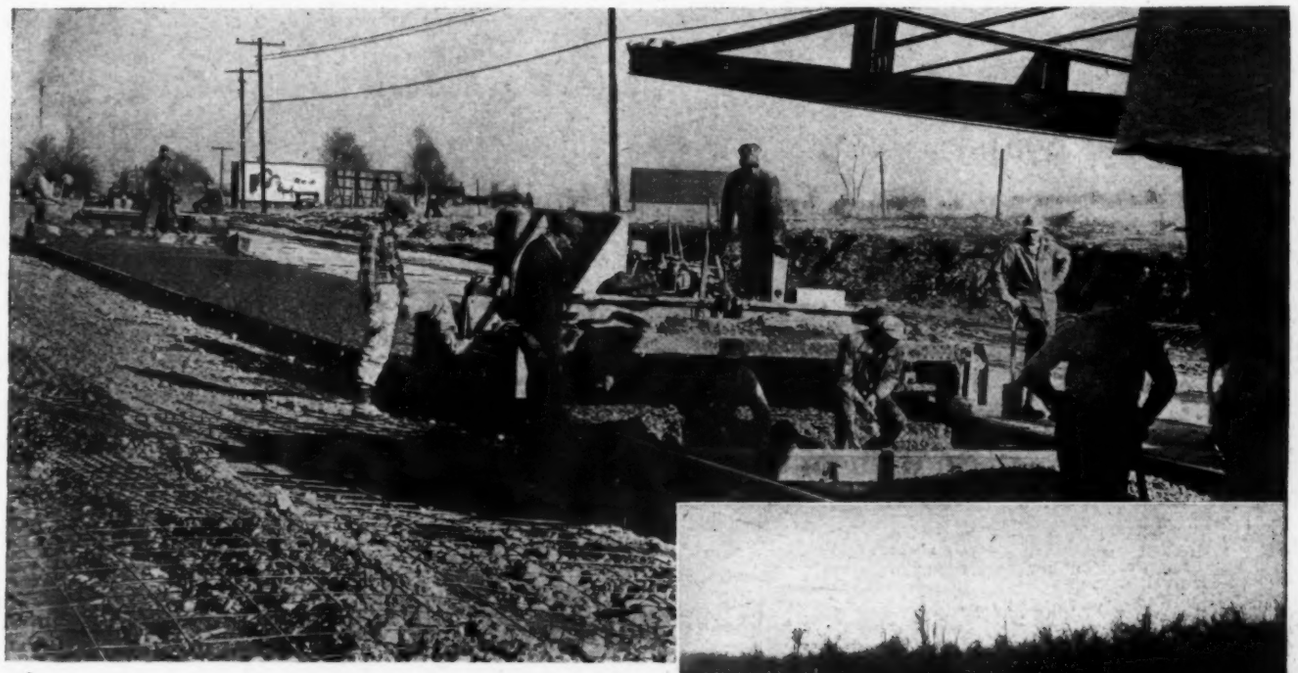
This is but one of the superior operating advantages built into Adams Motor Graders. Your local Adams dealer will gladly show you how and why Adams Motor Graders are *Your Best Buy—All Ways.*

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, INDIANA

Adams

MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS

One reliable source for all your ROAD-STEEL needs



Bethlehem Bar Mats ready for placement in new highway being built near Fulton, N. Y. Completely shop-fabricated, with strong clips that hold the bars rigidly in place, Bethlehem Bar Mats are easy to handle and install. They come in sizes and weights to meet the specifications of state highway departments.

Bethlehem Safety-Beam Guard Rail, shown here along a bridge approach in Kentucky, provides a sturdy continuous beam which holds runaway vehicles in check, redirects them parallel to the rail. Rolled of heavy steel plate, it can be installed on any type of post. Safety-Beam Guard Rail is easily visible day or night, and is especially suited for bridges, bridge approaches, along high embankments, and at other hazardous locations.

Are you planning a highway job that's going to call for drill steel? Wire rope? Bar mats? Guard rail? No matter how many different kinds of highway steel may be needed, put your requirements squarely up to Bethlehem.

When you deal with Bethlehem, you get from one source everything—that's right, everything!—in the steel line that you could possibly need in building a highway or highway-bridge. And Bethlehem service saves you time, too, for your complete order is handled as a unit, with individual items scheduled for delivery as you need them.

You'll like Bethlehem's steel service to contractors. Call us on your next highway job.

LEADING BETHLEHEM HIGHWAY PRODUCTS

Road Joints • Reinforcing Bars • Bar Mats • Guard Rail Guard Rail Posts • Wire Rope • Hollow Drill Steel • Fabricated Structural Steel • Sheet and H-Piling • Spikes • Bolts and Nuts • Tie-Rods • Timber Bridge Hardware

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

BETHLEHEM STEEL

STEEL for HIGHWAYS

ROADS AND STREETS

JUNE, 1947 • VOL. 90 • No. 6

With Roads and Streets Have Been Combined
Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

Design of Soil and Pavement Structures for Houston Expressways
Detailed summary of tests and design procedure for utilizing poor subgrade soil with safety for very dense traffic roadways

How 21-in.-thick Runway is Being Poured
...for B-36 traffic at Patterson Field. Staff report of design and construction features of 300 x 10,000 ft. runway and 25-in. concrete taxiway, involving many job innovations

Contractors at Work
Another camera visit to an interesting road job.

Soil Stabilization with Lime
How it has been accomplished successfully on low cost roads in central Texas

President's 2nd Traffic Safety Conference
Report of this significant meeting, to be held June 18-20, Washington, D. C.

How Michigan Counties Do Cost Accounting
Plan adopted by county road association described in detail

Autumn and Winter Problems
Beginning a monthly series on fall maintenance and snow removal, including reports on methods used during past year in northern states, counties, cities and airfields

Crawler Track Lubrication and Maintenance
Specific recommendations of a leading oil company, with illustrations and valuable data for equipment engineers and construction superintendents

"Low Down" on Sand Drains
Just what are the much-discussed "Vertical Sand Drains", used extensively on the West Coast and elsewhere to hasten fill consolidation over unstable ground? A timely summary with special staff-photos of methods used by several contractors

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How contractors do it—labor and time-saving tips

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

Gillette Publishing Company
Publication and Editorial Offices,
22 West Maple Street, Chicago 10, Ill.

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HALBERT P. GILLETTE, President; EDWARD S. GILLETTE, Publisher; H. J. CONWAY, Advertising Manager; Chicago Office: E. C. KELLY, E. H. HICKEY; New York Office: J. M. ANGELL, Manager, 155 E. 44th Street; Cleveland Office: LEE B. McMAHON, Manager, Leader Building; Los Angeles: DON HARWAY, West Coast Representative, 1709 W. 8th Street.

Acceptance under the Act of June 5, 1934, authorized Jan. 25, 1938, at Chicago, Ill. Published monthly. Subscription price $5.00 per year.

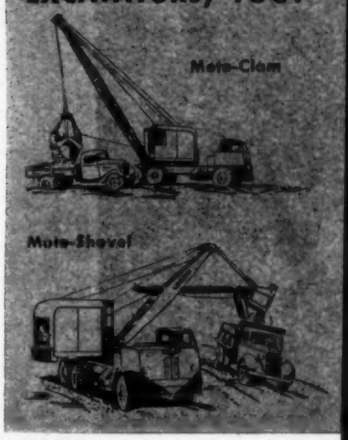
TO "STEEL" THE SHOW

USE LORAINS

IF it's a smooth-running, fast-moving steel erecting job, you're certain to find a Lorain Moto-Crane holding the center of the stage. Rubber-tire mobility permits these units to service every phase of the work—unloading at the team track, sorting, distributing, erecting steel on the job—quickly and economically. Possessing the power and strength for a "belly lift" and the capacity and range for a boarding-house reach, Moto-Cranes measure up to the many varied precision handling requirements typical of such jobs.

Lorain Moto-Cranes are available in a wide range of capacities on 4 or 6 wheel rubber-tire mountings with or without front wheel drive. And they offer a combination of features that get steel up and costs down in a hurry. Ask your local Thew-Lorain distributor for complete information now.

USE RUBBER-TIRE EXCAVATORS, TOO!



Reg. Trade Mark

Lorain

THE THEW SHOVEL COMPANY

LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

1-STOP BATCH PLANT SAVES BATCH TRUCKS

TWO FULL BATCHES Loaded in ONE OPERATION at both Aggregate and Cement Plant

In the Johnson 1-Stop Batch Plant, extra spot stops for 2-batch trucks are eliminated. Loading time for both aggregate and bulk cement is cut in half. Trucks get away to the paver minutes faster. Minutes saved by 1-Stop loading often permit reduction in number of trucks needed to keep paver busy. No time is lost at paver waiting for batch trucks.

Johnson 1-Stop Batch Plants combine new Johnson Dual Aggregate Bin, equipped with two multiple material batchers, and a Johnson Bulk Cement plant, equipped with two cement weigh batchers. Controls of both the aggregate unit and cement unit are grouped for 1-man operation.

For more facts on modern Johnson Batch Plants, see your Johnson distributor.

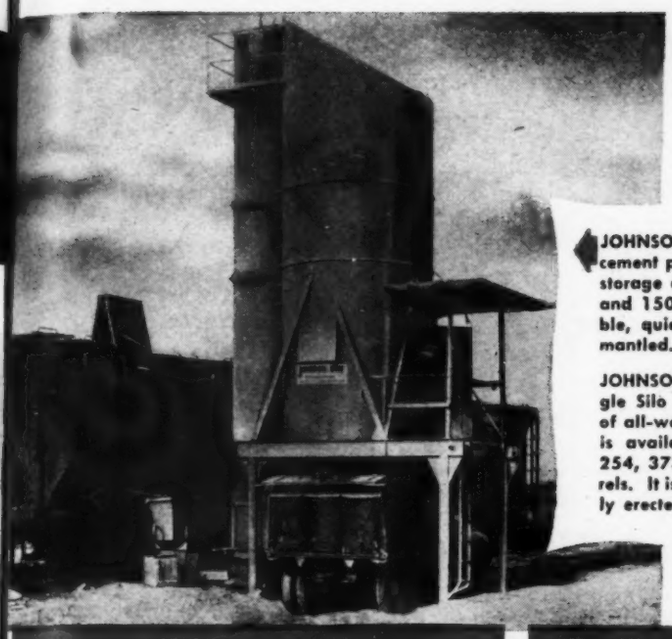
KOEHRING K PRODUCT

1-STOP LOADING at bulk cement plant. Cement bin equipped with two weigh batchers. Johnson Twin Silo Bulk Cement Plant shown above stores up to 1,556 barrels of cement, yet is fully portable.

1-STOP LOADING at aggregate plant. Johnson Dual Aggregate Batch Plant, equipped with two multiple material batchers, delivers both batches of aggregate simultaneously. 3-Compartment bin, 100-yard capacity.

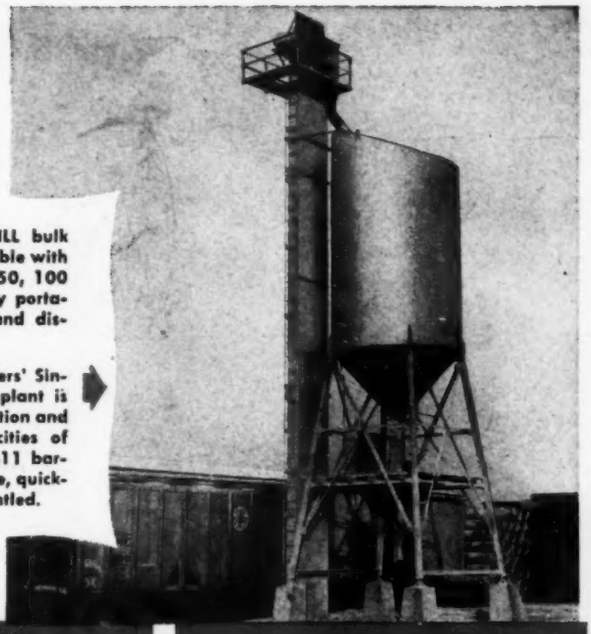
THE C. S. JOHNSON COMPANY

Koehring Subsidiary — Champaign, Illinois



JOHNSON DUTCH MILL bulk cement plant is available with storage capacities of 50, 100 and 150 barrels. Fully portable, quickly erected and dismantled.

JOHNSON Road Builders' Single Silo bulk cement plant is of all-welded construction and is available in capacities of 254, 373, 492 and 611 barrels. It is fully portable, quickly erected and dismantled.



PARSONS 250 TRENCHLINER*

Straight, Clean Trenches for Sewers, Pipe, Water Mains

Parsons 250 Trenchliner, product of more than 40 years of trencher building experience, incorporates all the desirable features that make money for you on trenching jobs. Telescoping boom for easy depth adjustment. Shifts from side to side across full Trenchliner width. Centralized T-man controls.

*Reg. Trademark

PARSONS CO.
NEWTON, IOWA

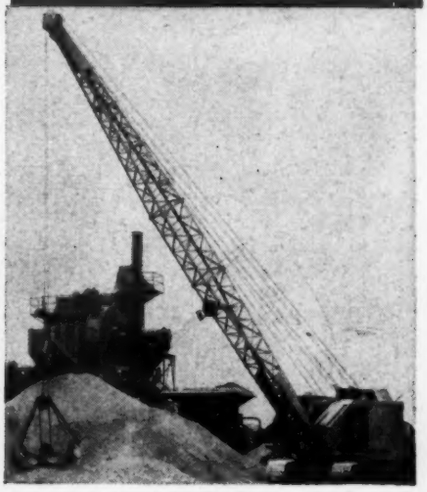
KWIK-MIX DANDIE CONCRETE MIXER

Tilted Flow-Line Discharge Chute Empties Drum Seconds Faster

Tilted Flow-Line Discharge Chute, exclusive on the Kwik-Mix Dandie line of concrete mixers, reaches deeper into the drum, intercepts tumbling concrete at just the right angle to maintain natural flow-line in discharge. Kwik-Mix Dandie mixers are available in the following sizes: 3½-S, 6-S, 11-S, 16-S.

KWIK-MIX CO.
PORT WASHINGTON, WIS.

KOEHRING 605 CLAMSHELL



High Lifting Capacity For Extra Tonnage

High lifting capacity of the Koehring 605 in clamshell work pays off on every cycle — 960 times each 8-hour shift. Swing is fast and smooth. Travel is simplified, easy on the operator, because it's never necessary to move the turntable into a precise travel position. Koehring 605 is ready for travel with turntable in any position.

KOEHRING CO.
MILWAUKEE 10, WIS.

a man's a giant with a BARCO

Barco is the accepted tool on thousands of hurry-up jobs all over the world. Foremen know that a worker gets powerful muscles of steel when you team him with a Barco Portable Gasoline Hammer. He works harder and faster with this tireless tool. The toughest going—even in hard-to-reach spots—becomes easy. Eleven special attachments make a Barco useful on dozens of *different* jobs.

BREAKING • DRILLING • DRIVING • TAMPING

BARCO

PORTABLE GASOLINE HAMMERS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

BARCO MANUFACTURING CO., NOT INC., 1815 WINNEMAC AVENUE, CHICAGO 40, ILLINOIS

IN CANADA: THE HOLDEN CO., LTD., MONTREAL, CANADA

Compact design, with weight properly distributed for a low center of gravity, gives the Bucyrus-Erie ⅜- to 2½-cu. yd. excavators their unusual stability . . . and provides the safe, sure working foundation you need for efficient, high-speed dragline operation. Long, widespread mountings and treads with large bearing areas are other factors giving the Bucyrus-Eries a surefootedness ordinarily expected only from heavier machines. And there are other features, too, which combine to deliver high output with Bucyrus-Erie draglines—the positive, full-feel control and slow speed, smoothly responding clutches and brakes which give the operator secure command of the load throughout the cycle; the all-welded, latticed box section boom that resists swing and compression stresses, and the strong, balanced Red Arch buckets that fill easily, carry smoothly, dump cleanly. For long hours of sustained production that result in bigger profits, you can't beat a Bucyrus-Erie. Let your distributor show you more reasons why they are such outstanding performers. 93E47

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY
SOUTH MILWAUKEE, WISCONSIN

Fitting into the scenery- and into BUDGETS, too-

KOPPERS

PRESSURE-CREOSOTED HIGHWAY BRIDGES

Here is one of the multitude of Koppers Pressure-creosoted highway bridges that have helped highway departments to please the traveler's eye . . . *and the taxpayer's pocketbook.* The smaller view shows how adaptable these bridges are to special conditions. Vertical clearance is limited, and so a long, clear span is desirable. The designers therefore supported the deck on a long, deep girder.

Koppers Pressure-creosoted trestle bridges are economical in first cost; engineers have reported savings of 50% or more over other permanent types of construction. They require little maintenance, as the treatment gives enduring protection against decay and weathering. They can be readily altered in dimension if changing traffic conditions demand it, and in case of relocation maximum salvage of parts is possible. Koppers is equipped to preframe all members to blueprint prior to treatment, and assembly can be speedily handled by highway crews with local labor and equipment.

You probably have a number of bridges in prospect in connection with your highway program. Ask how Koppers pressure-treated bridges can help make your budget dollars go further.

K KOPPERS **PRESSURE-TREATED WOOD**

KOPPERS COMPANY, INC.

PITTSBURGH 19, PENNSYLVANIA

That's Real "Down-to-Earth Moving"!

When it comes to earth moving, those Oliver "Cletrac" crawler tractors are in a class by themselves. The way those babies handle themselves in that rough going is a sight to behold.

My Oliver "Cletrac" dealer was the boy who gave me the dope on stepping up our schedules. "Look," he said, "when you're dozing or scraping, you get an uneven load on the tractor. So you've got to keep jackknifing from side to side to overcome the uneven pull. That is, unless you've got Cletracs on the job. They have an exclusive steering principle that permits them to balance the pull of one track against the pull of the other. You can keep an offset load moving straight ahead . . . there's no wasted motion. And, they are easier and safer to handle on rough, steep and uneven ground."

He had the right angle, all right. Why we've cut our clearing time right down to the bone. The Oliver "Cletrac" dealer sure knows this earth-moving business. He's a good man to know!

OLIVER
Cletrac
SALES
SERVICE

Cletrac

a product of

The OLIVER Corporation

Industrial Division: 19300 Euclid Ave., Cleveland 17, Ohio

"THE SIGN OF EXTRA SERVICE"

FROM HAND-BAGGAGE SIZE . . . ON UP!

GORMAN-RUPP PUMPS WILL FIT YOUR JOB

You may want a pump as small and easy to carry as a bag of tools—Gorman-Rupp has such a pump that will deliver as much as 3,000 gallons per hour. Or, you may have a heavy de-watering job that calls for as much as 125,000 gallons per hour at continuous operation. Whatever the size or application—get one of these dependable, Gorman-Rupp BLUE pumps!

If you want a self-priming, centrifugal pump that never has to be shut down to be cleaned out get a dependable Gorman-Rupp BLUE pump, which has no recirculation orifice to get plugged or control valve to get jammed.

For size, for weight, for power, for cost — Gorman-Rupp self-priming centrifugal pumps can't be matched! Our nearest distributor will send you one and let you be the judge. If it doesn't do a better pump job than any other you have seen, return it at our expense—and it won't cost you a cent!

Originators in 1936 of the Famous
Blue Pump that others now imitate.

THE GORMAN-RUPP COMPANY

323 BOWMAN STREET • MANSFIELD, OHIO

So Easy! with "PRECISION" AIR CONTROL

LIMA

THE LIMA DIAMOND FOR OVER 75 YEARS AN EMBLEM OF QUALITY WORKMANSHIP

No longer is it necessary to shove and tug at heavy control levers; no longer is output penalized due to operator fatigue. LIMA "Precision" air control has taken the effort out of operating by replacing the conventional hard-to-throw levers with positive, smooth operating air control valves—valves that require only a mere touch to put the machine through its paces. LIMA "Precision" air control clutches are free from constant adjustment. The next time you get a heavy-duty shovel, crane or dragline be sure to get a LIMA with "Precision" air control. LIMA paves the way to greater output with less operator fatigue.

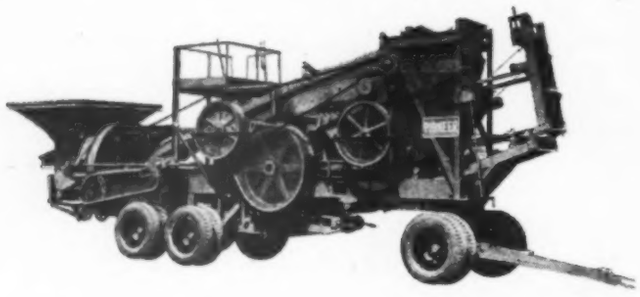
LIMA LOCOMOTIVE WORKS, INCORPORATED
Shovel and Crane Division **LIMA, OHIO, U. S. A.**
OFFICES IN PRINCIPAL CITIES

LIMA

Capacities . . . SHOVELS ¾ YARD TO 5½ YARDS • CRANES 13 TONS TO 100 TONS • DRAGLINES VARIABLE

Moved ···reset···ready··!

in less than 8 minutes!



No moving permits required—This 40,000 lb. Pioneer Plant meets *all* state highway load limits for weight, length, height and width. With the feeder conveyor folded for traveling, it is 33′ long, 12′6″ high and 8′1½″ wide.

Loading Hopper is built on to the plant eliminating a field conveyor and hopper—speeds resetting.

Double V-belt and tumbler shaft drives provide a simple, efficient means of power transmission.

Specifications: 10″ x 24″ Jaw Crusher, 24″ x 16″ Roll Crusher and 3′ x 8′—2½ deck vibrating screen.

Can you shave in eight minutes?
That's snappy performance if you do!

But in less time than that, W B. Linnan respotted his Pioneer 34-S crushing and screening plant in a pit at Buena Vista, Iowa. In addition to being highly portable, this small Pioneer plant produces 2,000 cubic yards of material a day. It is operated efficiently with only two men—one on the crusher—one on the dragline.

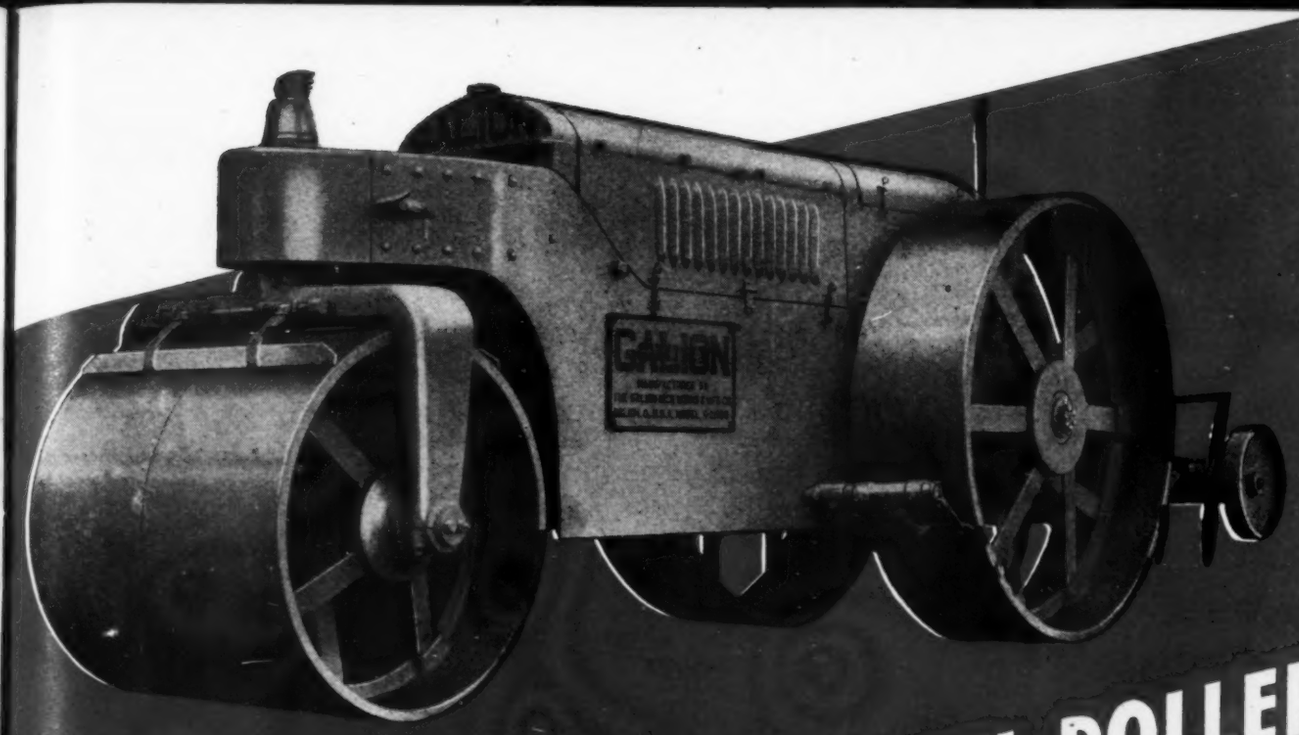
While the power unit usually is mounted on the plant chassis, the Linnan plant is driven by a tractor using a power take-off drive

If you have crushing and screening jobs that involve considerable moving from one pit to another . . . or respotting within a pit . . . write for complete information about this portable Pioneer *Continuflo* plant. You can depend on it for higher output—lower maintenance.

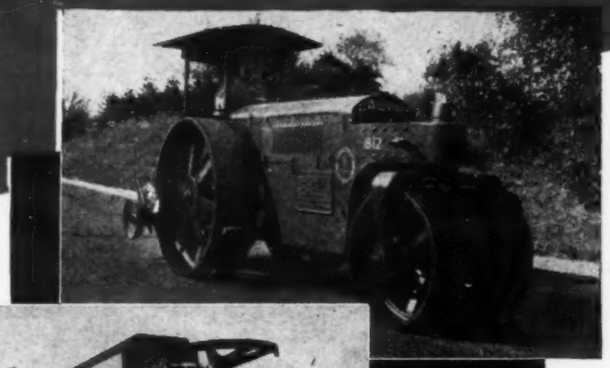
PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota

BUY BOTH—
Higher Output,
Lower Upkeep!

Pioneer
Continuflo EQUIPMENT



GALION 3-WHEEL ROLLERS Start Easily



FIVE SIZES 6 TO 12 TONS

---because the master clutch completely disengages the transmission so that there is no "drag" on the engine to make starting difficult.

Those who must watch job costs appreciate GALION'S reputation for "no tinkering, no coaxing, no lost rolling time." The assurance of a full days work from GALION Rollers is another of the reasons why they are such a profitable investment.

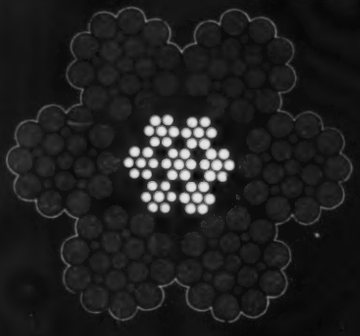
FEATURES

Hydraulic steering--Simple operating controls.
Operator has good visibility of work. . . . . .
Heavy-duty roller bearings at all vital points. . .
Large diameter rolls. . . . . .
Engine and transmission mounted on sub-frame.
Multiple plate clutches for positive action, long life, and velvet-smooth operation. . . . . .
Extra-rugged construction throughout. . . . . .
Powerful engine--Diesel or gasoline. . . . . .

The GALION IRON WORKS & MFG. CO.
General and Export Sales Offices
GALION, OHIO, U. S. A.

GALION IRON WORKS hydraulic **GRADERS · ROLLERS**

Resists Abuse Better...



UPSON-WALTON IWRC* WIRE ROPE

FOR winch lines on trucks and tractors . . . for hoist lines on power shovels and in-haul ropes on draglines . . . for hot ladle cranes in steel mills and foundries . . . for cable scrapers, stump pulling ropes, rotary drilling lines for oil wells, mining machines—industry after industry operates under conditions which require IWRC (*Independent Wire Rope Center) construction to do the best job.

IWRC construction resists crushing better where ropes crosswind on drums, retains its circular cross section when bent around small sheaves and drums under extra heavy loads. It resists stretching, resists heat and increases the ultimate strength of the rope itself.

IWRC construction is available in every type of wire rope made by Upson-Walton.

For best performance, select the U-W rope best suited to your needs and specify *IWRC, Perfection Grade, Layrite Preformed.*

U-W

Established 1871

All Upson-Walton Products Available Through Your Local Upson-Walton Distributor

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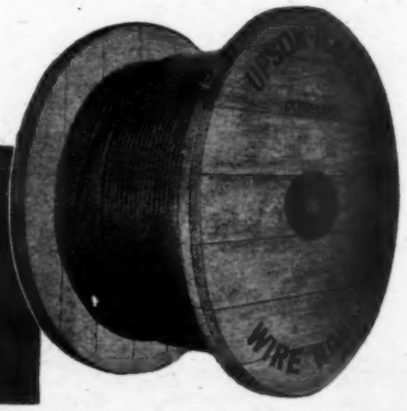


THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street, New York 4 — 737 W. Van Buren Street, Chicago 7 — 241 Oliver Building, Pittsburgh 22

The Right Combination--

--for SERVICE SATISFACTION

LINK-BELT SPEEDER

SALES and SERVICE HEADQUARTERS

In the line of Link-Belt Speeder Shovel-Cranes there is a type and size to meet every requirement. And located near you is a Link-Belt Speeder distributor, informed, experienced and equipped to give you valuable aid in selecting machinery for your particular needs, and in keeping your equipment in top-notch operating condition.

The combination of skilfully designed, precision-built Link-Belt Speeder shovel-cranes, with interested, capable and cooperative distributor service, is your assurance of profitable performance.

Twenty-five models of crawler and wheel-mounted shovel cranes, from 3/8 to 3 yd. capacity, are all readily convertible for any of the 6 major functions: crane, dragline, clamshell, shovel, pile-driver, trench-hoe. The broad range of sizes and multiple use features enable the operator of a Link-Belt Speeder to do more work — more *kinds* of work, *more of the time!*

LINK-BELT SPEEDER

LINK-BELT SPEEDER CORPORATION
A DIVISION OF LINK-BELT COMPANY
CEDAR RAPIDS, IOWA

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

HOT OIL FAST!
..with Less FUEL.. WATER.. WORK

Handle that road oiling contract more profitably with a Cleaver-Brooks Tank Car Heater

The quicker you get the oil or asphalt in the tank car on the siding up to application temperature and flowing into the distributors—the faster your road crews can get going and finish the job.

With a Cleaver-Brooks Tank Car Heater you can have hot, dry steam flowing to car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks Tank Car Heater requires less fuel and water.

Perfected — highly efficient — you can tow it with car or truck to tank car siding, construction site, material yard or other locations where you need steam.

The famous Cleaver-Brooks four-pass fuel travel means low fuel consumption; the turbine type condensate return system cuts water loss — every drop of condensate goes back to the heater under pressure.

Built for full capacity — full time work — Cleaver-Brooks Tank Car Heaters will give you the most in production hours on the job. Write for bulletins and complete information.

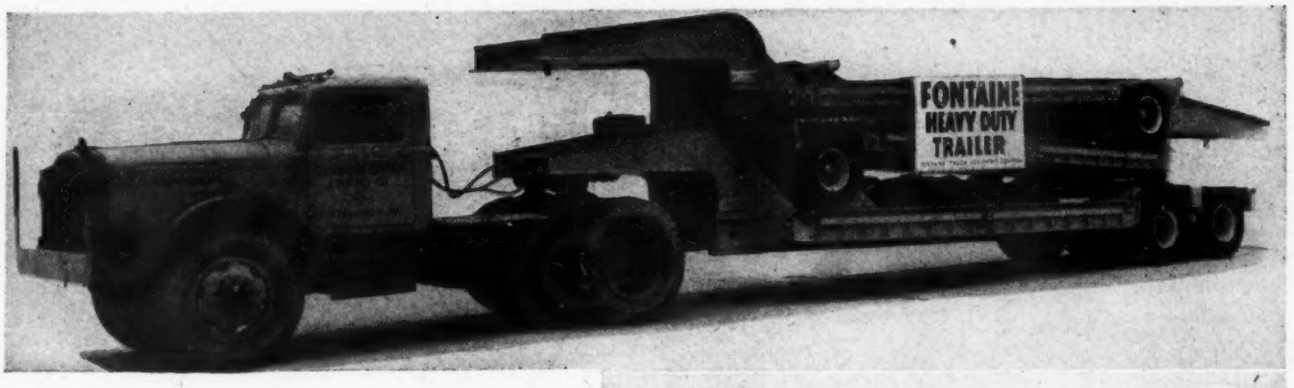
CLEAVER-BROOKS COMPANY
5106 North 33rd Street, Milwaukee 9, Wisconsin

Write On Your Business Letterhead . . . For the Bituminous — mix Calculator — a ready reference slide rule showing weight of mix needed in lbs. and tons in relation to width and depth of area to be covered.

Cleaver-Brooks

PIONEERS AND ORIGINATORS OF

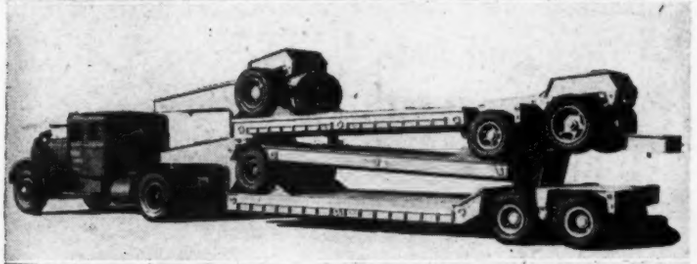
TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . . AUTOMATIC STEAM-PLANTS

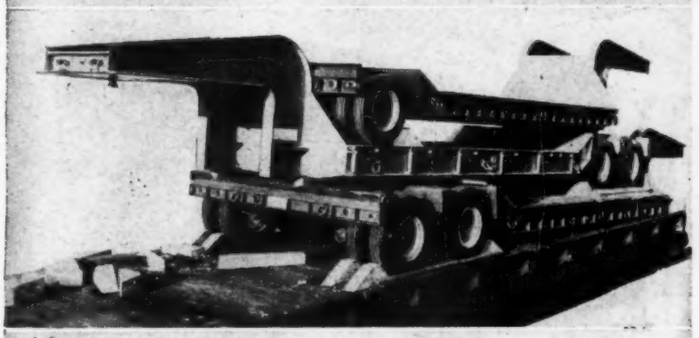


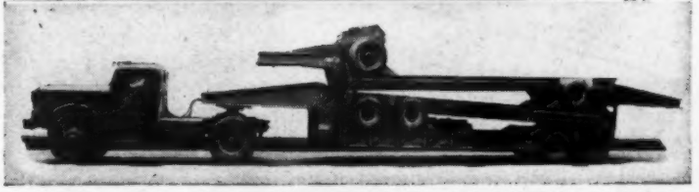
DELIVERIES ARE GOOD

By TRUCK and by TRAIN To FLORIDA and MAINE

Every day they roll out of the huge Fontaine plant. Every day they get going on new jobs . . . jobs they are designed to do. Wherever there is heavy hauling to be done, Fontaine Trailers can do it best.







Any Capacity up to 100 tons

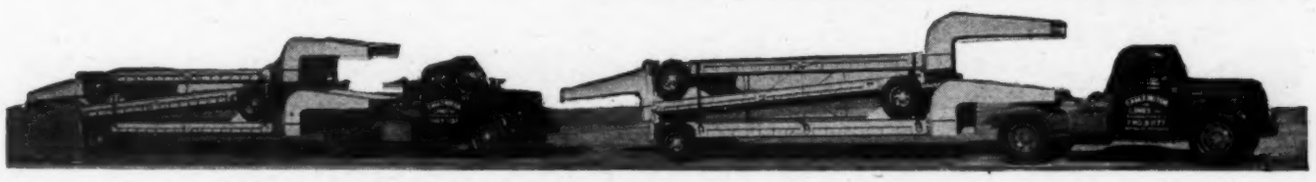
Write for catalogue and name of your nearest Distributor

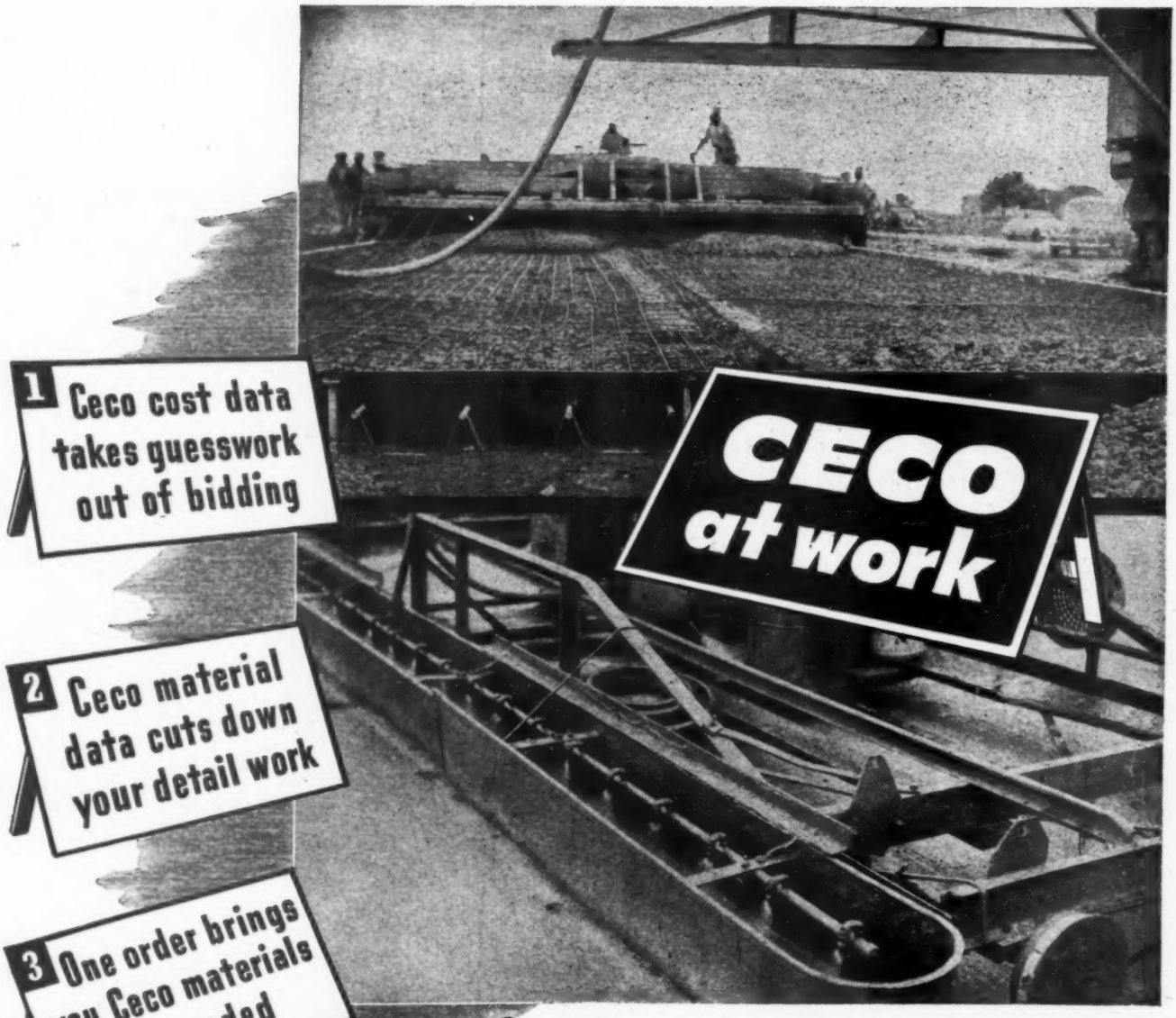
TRAILER DIVISION
FONTAINE TRUCK EQUIPMENT CO.
3821 FIRST AVENUE, NORTH
BIRMINGHAM 6, ALABAMA

FONTAINE

HEAVY DUTY

Trailers




1 Ceco cost data takes guesswork out of bidding
2 Ceco material data cuts down your detail work
3 One order brings you Ceco materials as needed
CECO at work

a 3 Point Program for Surer Road Building Profits

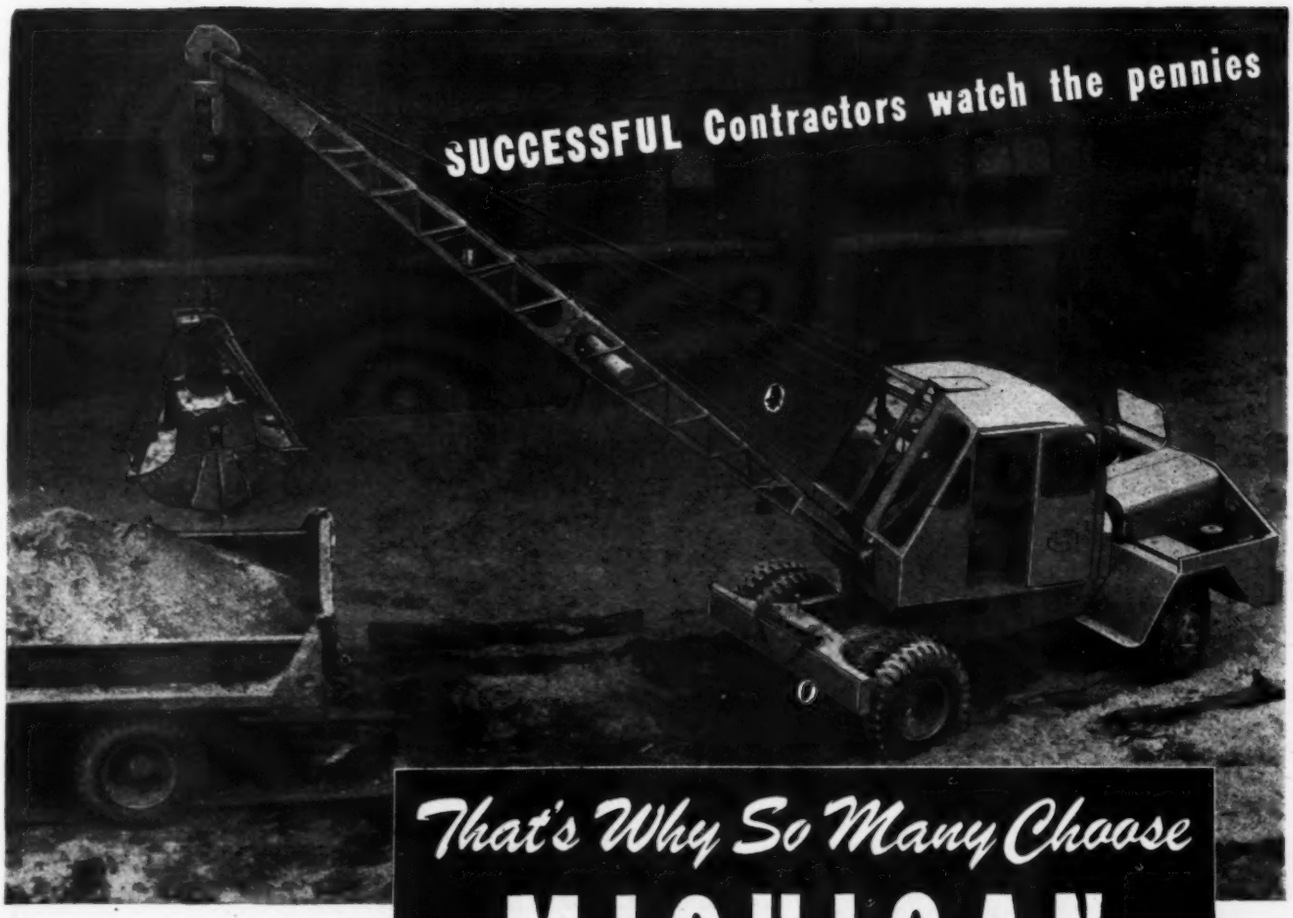
CECO offers you more than precision road building materials. It offers you a 3-point program for surer profits based on construction knowledge gained from years of practical experience. Call any one of 23 offices located coast to coast, for engineering skill and fine road building materials . . . plus a plan for road building profits. Remember Ceco's 3-point program takes the guesswork out of bidding, cuts down your detail work and one order brings you materials where you need them, when you need them.

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois

CECO STEEL

TYPICAL CECO HIGHWAY PRODUCTS • Welded Wire Fabric • Metal Center Strips
Cecure Curing Compound • Reinforcing Steel • Load Transfer Devices • Joint Sealing Compound
Dowel Bar Supports and Sockets • Stake Pins • Expansion Joints • Sub-Grade Paper

In construction products **CECO ENGINEERING** *makes the big difference*



That's Why So Many Choose

MICHIGAN

THE PIONEER AIR-CONTROLLED TRUCK-TYPE SHOVEL-CRANE

Noted for
OPERATING ECONOMY
•
SPEED ON THE ROAD AND ON THE JOB
•
DEPENDABILITY AND VERSATILITY

With contractors who keep a sharp eye on costs, MICHIGAN ranks "tops." They know that they can depend on MICHIGAN to deliver top-notch performance, day after day. They know that with MICHIGAN they can "come out on top" even on those small, scattered jobs that cannot be handled profitably with ordinary equipment . . . Get **all** the facts about MICHIGAN Mobile SHOVELS-CRANES—send for Bulletin E-27.

FINGER TIP AIR CONTROLS • 6 to 12 TON CRANES
• • • • 3/8 YD and 1/2 YD SHOVELS • • • •
FULLY CONVERTIBLE TO ALL STANDARD ATTACHMENTS

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR, MICHIGAN

TRUSCON WELDED STEEL FABRIC

Equalizes Load Stress and Helps Maintain High Pavement Efficiency

Plain Pavement
Open Crack
Structural Action at Crack in Plain, Non-Reinforced Pavement
Reinforced Pavement
Closed Crack
Structural Action at Crack in Truscon Welded Steel Fabric-Reinforced Pavement

Note that as heavy wheel load approaches crack in plain pavement, slab end carries entire load weight with no assistance from non-loaded slabs.

As wheel load approaches closed crack in Truscon Welded Steel Fabric reinforced pavement, aggregate interlock renders the crack-joint shear resistant, and *both* slab ends, instead of one, carry the load.

● The tremendous landing impact of giant aircraft is no greater than that to which almost every square foot of your highways is subjected each day. The use of Truscon Welded Steel Fabric for reinforcement is highly desirable. Authoritative and official loading tests prove that cracks in reinforced concrete pavements consistently average a load transfer of about 48% at all seasons of the year. This value represents practically 100% shear-resisting capacity, since a load transfer of 50% is the absolute maximum that could occur theoretically under any conditions.

Cracking in concrete pavements cannot be eliminated entirely, but experience has proved that when the pavement slab is reinforced with Welded Steel Fabric between joints, the formation of wide cracks is prevented. The reinforcing holds the aggregate of the fractured slabs in close contact and enables the slab to function as a unit rather than as individual parts.

You can be sure that Truscon Welded Steel Fabric Reinforcement, and associated Truscon steel roadbuilding products, will build better, lower-cost roads for the communities you serve, and greater prestige for you.

TRUSCON STEEL COMPANY
Reg. U. S. Pat. Off.
YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation

Manufacturers of a Complete Line of Welded Steel Fabric . . . Concrete Bars . . . Contraction Joints . . . Dowel Assembly Units . . . Curb Bars . . . Complete Steel Buildings.

This Emblem

INTERNATIONAL

Identifies Great Trucks

BACK OF THE TRUCK – THESE 3

International TRUCK SERVICE • International ENGINEERED PARTS • International APPROVED ACCESSORIES

Rugged stamina! Long mileage! Economy of operation!

International Trucks provide all three in such abundance that for 16 years more heavy-duty International Trucks have served American commerce and industry than any other make.

And to make sure that every operator gets every profitable mile and every available economy from every International Truck, this is the *Three-Part Service* International provides:

MAINTENANCE AND SERVICE

Quickly available everywhere from thousands of International Dealers and the nation's largest company-owned truck-service organization – International Branches.

ENGINEERED PARTS

Precision-made, like the originals in International Trucks – wear better and last longer.

APPROVED TRUCK ACCESSORIES

A complete line for every truck need. Triple-checked against the most rigid standards to assure efficient, trouble-free performance.

Yes, International *Three-Part Service* makes sure that operators get the extra mileage, the dependable stamina and the low operating cost built into all International Trucks.

Motor Truck Division
INTERNATIONAL HARVESTER COMPANY
180 N. Michigan Ave. Chicago 1, Ill.

40TH ANNIVERSARY OF INTERNATIONAL TRUCKS
1907-1947—Forty years of International Truck Service to Industry, Commerce, Agriculture

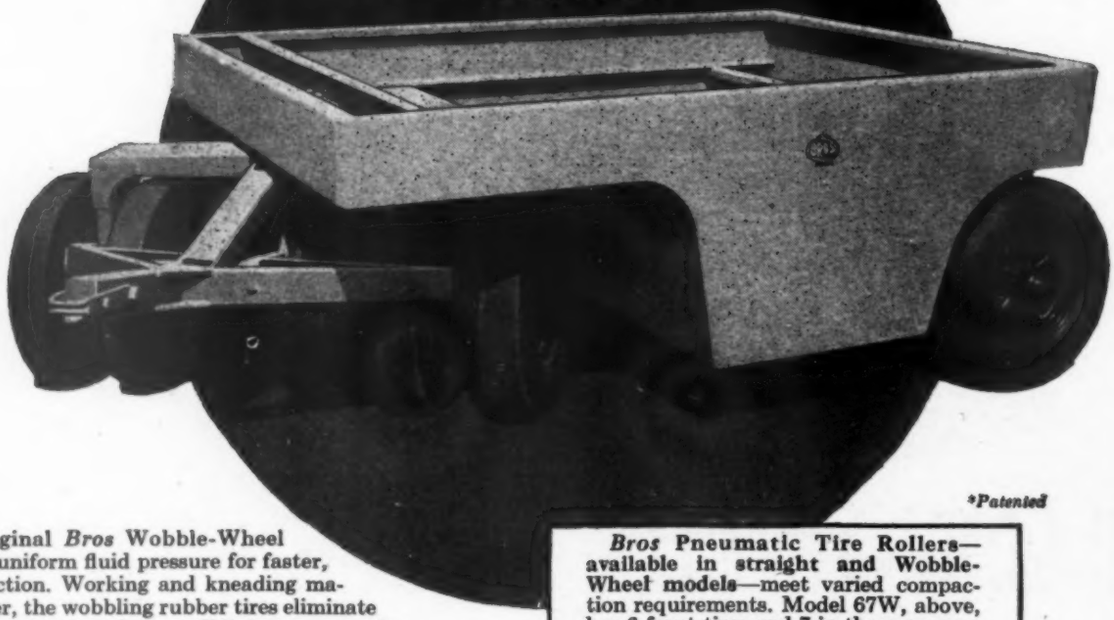
Tune in James Melton on "Harvest of Stars" Sunday! NBC Network.

INTERNATIONAL

INTERNATIONAL *Trucks*

ONLY BROS MAKES THE WOBBLE WHEEL*

PNEUMATIC ROLLER
For Fluid Pressure Compaction



*Patented

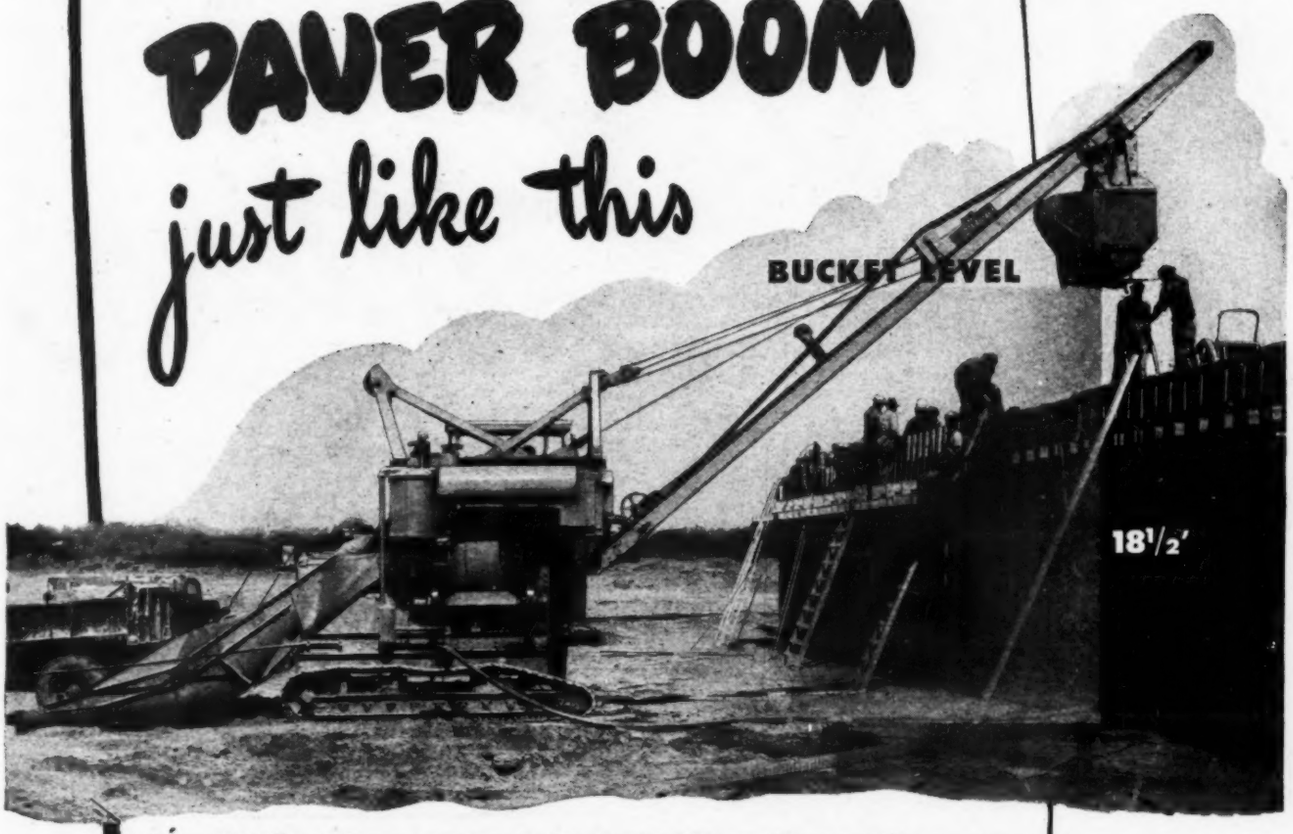
Only the original *Bros* Wobble-Wheel roller applies uniform fluid pressure for faster, firmer compaction. Working and kneading materials together, the wobbling rubber tires eliminate voids, build durable foundations. Efficient compaction is easily and economically obtained at speeds up to 15 miles an hour. *Bros* Wobble-Wheel rollers are recommended for packing earth fills, rolling crushed rock bases, compacting stabilized roads, rolling bituminous surface airport construction and maintenance and turf surfaces.

***Bros* Pneumatic Tire Rollers—available in straight and Wobble-Wheel models**—meet varied compaction requirements. Model 67W, above, has 6 front tires and 7 in the rear, supporting a recommended load of 7 tons and a maximum of 11 tons. Model 45W shown below uses 4 front and 5 rear tires for a 4 ton recommended load and an 8 ton maximum.

BROS

WM. BROS BOILER AND MANUFACTURING COMPANY • MINNEAPOLIS 14, MINNESOTA

There is NO other PAVER BOOM just like this



Your MultiFoote Paver, equipped with the MultiFoote Elevating Boom, gives you increased versatility over a wide breadth of jobs. The average retaining wall, bridge abutment, one-story foundation and reinforced concrete wall are all within reach of your Elevating Boom.

With your MultiFoote you mix and place without the aid of a crane or other auxiliary equipment on this kind of work. It means less investment for equipment—less handling of materials—and faster pouring—all of which totals greater profit!

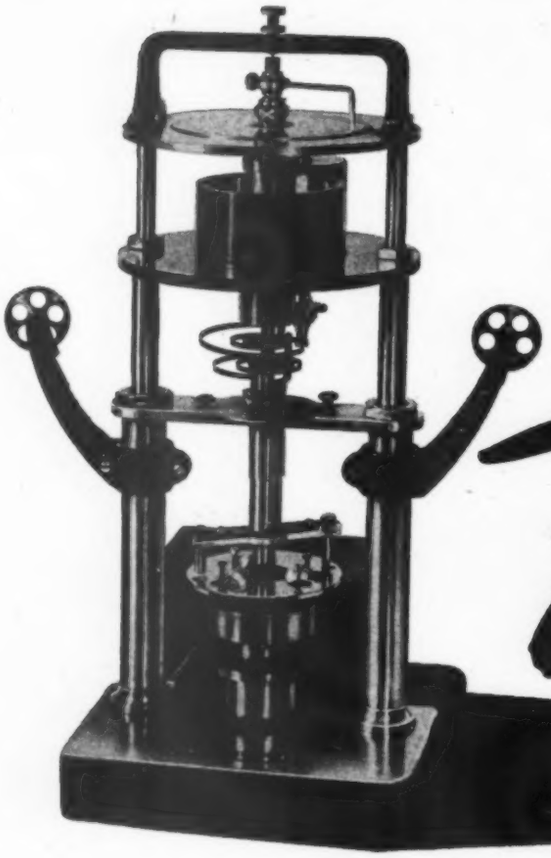
Do not be misled by other terms for standard booms that can be raised to limited degrees. The MultiFoote Elevating Boom was designed specially for pouring to heights beyond the possibilities of the standard boom and was the first of this type. The MultiFoote Elevating Boom has met the rigorous conditions of all kinds of work and is the *only* elevating paver boom that has been proved in years of service. Let us send you complete details. It is available for both the DuoMix (Dual Drum) 34-E and the Single Drum 34-E Pavers.

THE FOOTE COMPANY, 1936 State Street, Nunda, New York

MULTIFOOTE
CONCRETE PAVERS

See page 109

Builders of ADNUN BLACK TOP PAVERS, MULTIFOOTE CONCRETE PAVERS, AND FOOTE KINETIC MIXERS



GOVERNOR OF *Friction*

(*Herschel Coefficient of Friction*)

As power is the life blood of industry, friction is the deadly poison that can slow wheels, reduce efficiency to the point of disaster.

Correct lubrication, obviously, is the preventive which protects power against the depredations of friction. And . . . the coefficient of friction of a lubricating oil is an important factor in the utilization of input power in all machines.

Sinclair Research is ever alert to aid you in developing maximum output from your equipment with such apparatus as the Herschel Coefficient of Friction machine, shown above. This machine is invaluable where lubrication of all parts of machinery is concerned.

With such apparatus and the continuous effort of skilled experts in refinery control, Sinclair assures you of outstanding performance from lubricants developed specially for your specific application.

Sinclair Automotive Lubricants
FOR MINIMUM FRICTION—MAXIMUM POWER
OPALINE MOTOR OIL
OPALINE TBT OIL
(For severe service)
TENOL (Heavy Duty—For Diesels)
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SINCLAIR

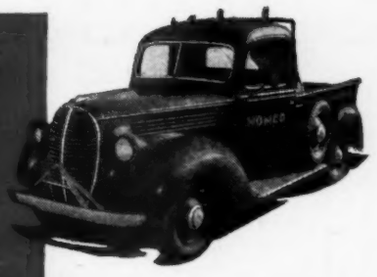
Lubricants for Industry

FINEST CRUDES + EXPERT RESEARCH and MANUFACTURING CONTROL = OUTSTANDING PERFORMANCE

"Certainly

FORD TRUCKS LAST LONGER!"

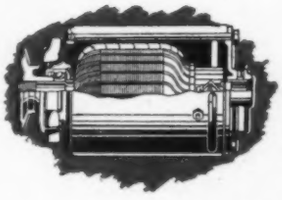
"That's why we operate 207 of them!"—says C. R. Littlepage, Supt. of Transportation, Houston Oil Field Material Co., Houston, Texas.



Two 1939 Ford Trucks owned by HOMCO that prove the point: (Above) Driver Joe Zachary and Pickup, mileage 207,316; (Below) Driver H. O. Carpenter and Pickup, mileage 228,398. Supt. Littlepage adds: "Our Ford Trucks deliver trouble-free miles at minimum cost!"

One BIG Reason—

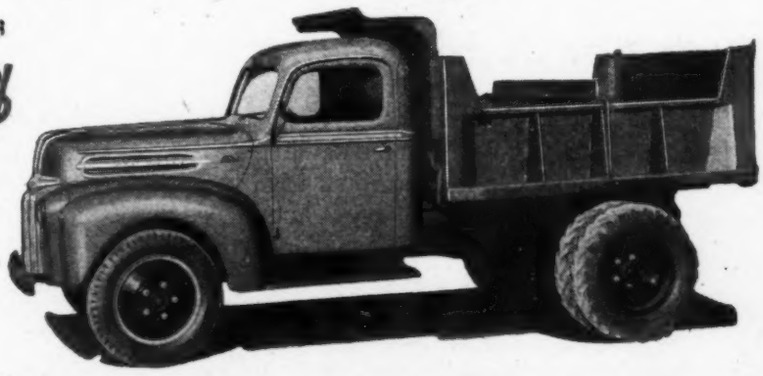
FORD ELECTRICAL UNITS STAND UP!



The fame of Ford Trucks for swift, sure starting and all-weather reliability rests solidly on Ford design and Ford quality . . . in particular, the Ford Electrical System. More than 12 million Ford-designed starter motors and generators have been built in Ford shops. Repeated tests for electrical efficiency consistently prove these fine, Ford-built units to be outstanding. Long, trouble-free generator service is assured by such long-life features as pre-lubricated, sealed ball bearings on armature shafts, and by bushings wick-lubricated from a reservoir with an overflow drain, which prevents surplus oil from reaching commutator. Ford starter motors are pre-lubricated, requiring no oiling whatever. Ford wiring and generous battery and generator capacity adhere strictly to the highest standards of the industry. The simplicity and high efficiency of the Ford starting system circuit, too, have much to do with Ford's faithful starting performance.

Ford

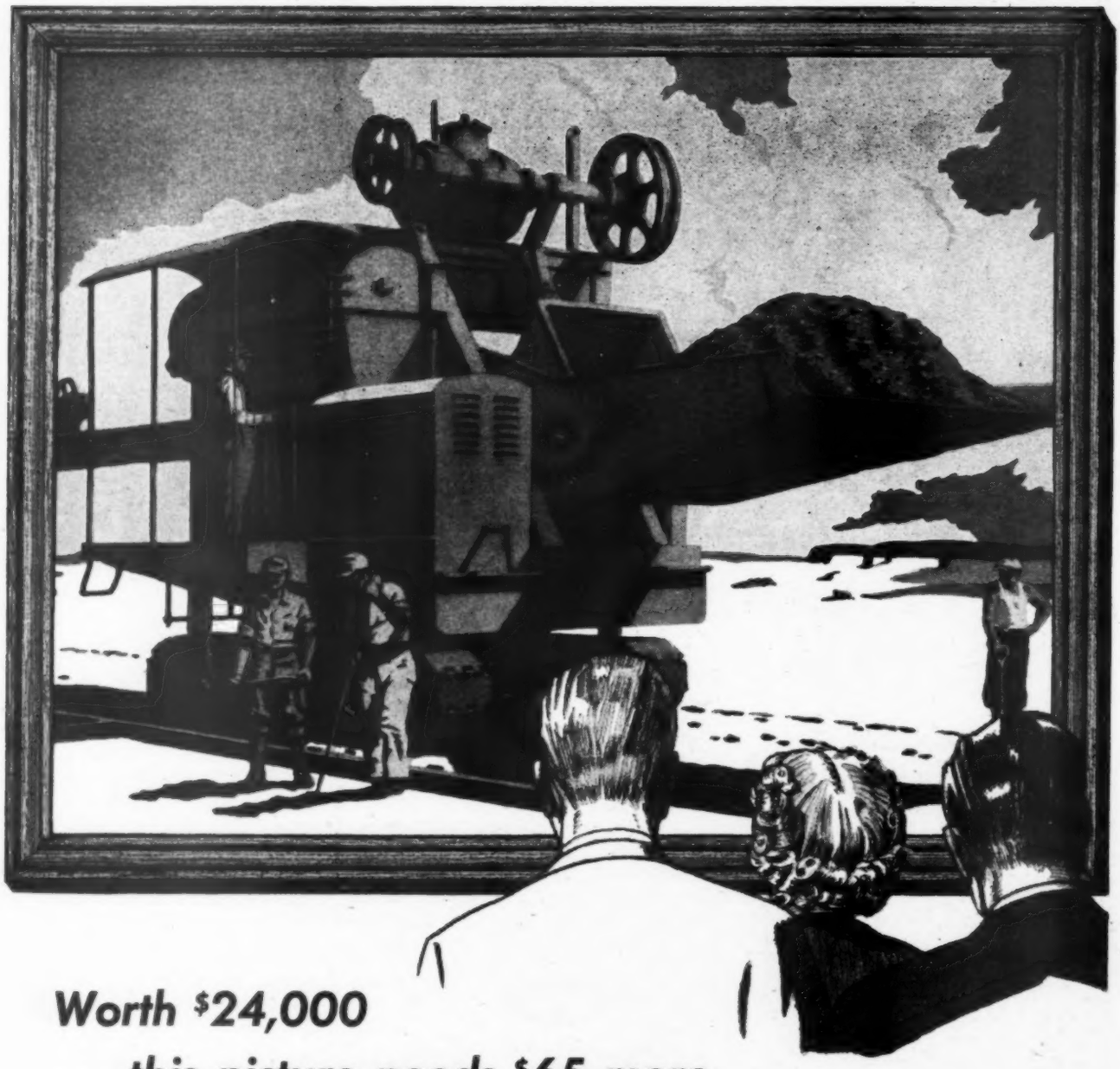
THE 6 YOUR PICK OF POWER THE V-8



Hauling bulk building and street construction materials, the Ford Dump Truck chassis provides capacity, maneuverability and long life that have made it a prime favorite everywhere. This shows an 8-foot-long center-gate Dump body for "batch-work," by Anthony Company, Streator, Illinois.

Only Ford Brings You All These Long-Life Features: Your choice of engines, V-8 or SIX —each with new Flightlight oil-saving 4-ring pistons and precision bearings · true truck frames in all models, with siderails *doubled* in heavy duty units · rear axle shafts free of weight-load, ¾-floating in half-ton units, full-floating in all others · big, easy-action brakes with non-warping, score-resistant cast drum surfaces—in all, *more than fifty* such endurance engineering features! And more than 100 body-chassis combinations to choose from. See your Ford Dealer now!

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE!



Worth $24,000

. . . this picture needs $65 more

This efficient, fast, labor-saving road-paver cost well over $24,000—but it couldn't pave a square foot without wire rope. *That's* what is missing in the picture. How much does the missing wire rope cost? Well—ordinary, non-preformed wire rope costs about $52. The best of all wire ropes—Preformed Improved Plow Steel costs about $65.

Be safe. Be sure. If you use wire rope, use the best. Specify Preformed Improved Plow Steel for your next rope. And when you buy a machine—any machine—make certain it is equipped with Preformed. You will like it because it lasts longer. Your workmen will like it because it is easier and safer to handle.

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WRITE FOR FREE COPY of helpful book about Preformed.
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ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

HANDLES EASIER - LASTS LONGER

YOU CAN SERVE YOUR CUSTOMERS BETTER

with a truck like this!

Here's a picture of a *"Job-Rated"* truck . . . a truck that fits its job.

Take a good look at it!

This truck has exactly the right one of 7 Dodge *"Job-Rated"* engines to provide the pulling power the owner needs, with the economy he wants.

It has exactly the right one of 5 Dodge *"Job-Rated"* clutches, 4 transmissions, 18 rear axles . . . the right units throughout . . . for "top" performance with the loads it carries, over the roads it travels. It is completely *"Job-Rated"* to fit its job . . . to last longer, and for dependable, money-saving operation.

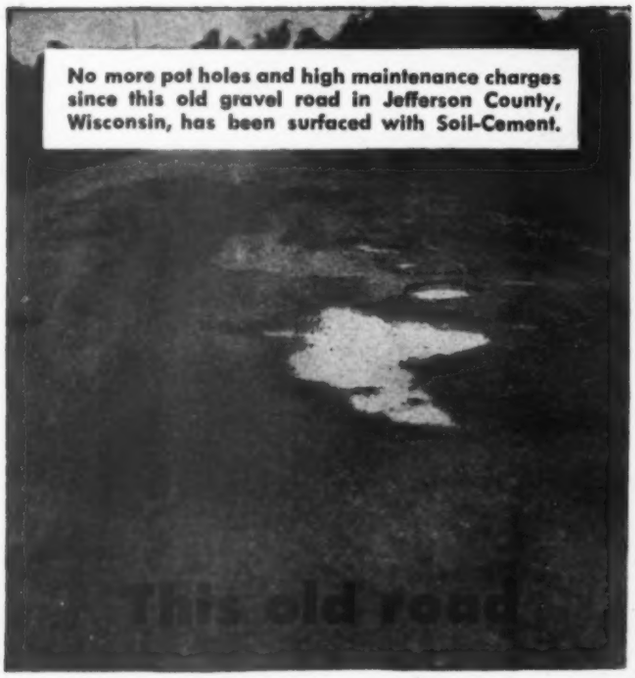
YOU, too, can buy a truck that will fit *your* job . . . giving you better performance at lower cost.

To get such a truck, see your Dodge dealer. He will analyze your needs. He will recommend the right truck. He will serve you well . . . including dependable truck service whenever you need it. . . . See or call him today.

DODGE

ONLY DODGE BUILDS *"Job-Rated"* TRUCKS

Fit the Job . . . Last Longer !


No more pot holes and high maintenance charges since this old gravel road in Jefferson County, Wisconsin, has been surfaced with Soil-Cement.

plus

Portland Cement

made this ➡

SOIL-CEMENT offers an economical means of transforming native in-place materials into hard-surfaced, long-lasting roads and streets giving many years of convenient all-weather service for light traffic.

Nearly every county has many miles of roads which do not carry enough traffic to justify high type paving. But these light traffic roads can profitably be surfaced with Soil-Cement because the Soil-Cement method utilizes 90 per cent of the granular material or earth already on the road site.

More than 21 million square yards of Soil-Cement roads and streets have been built in 254 counties and 143 towns in the past 12 years; over 22 million square yards are in service in 177 airports.

Write for free illustrated folder, "Soil-Cement for Light Traffic Roads and Streets." Distributed only in United States and Canada.

PAVE AND SAVE WITH SOIL-CEMENT

PORTLAND CEMENT ASSOCIATION

Dept. A6-28, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

"Get me another Ward LaFrance - they're built to do the job"

Here's the heavy-duty truck for big jobs. Ward LaFrance trucks and over-the-road tractors are built for heavy loads and rough going.

Extra power and pay load capacity is assured with the rugged, big Ward LaFrance. Sturdy construction throughout means profitable performance with a minimum of repairs and maintenance. For trouble-free service specify Ward LaFrance trucks—designed, engineered and manufactured to stay on the job.

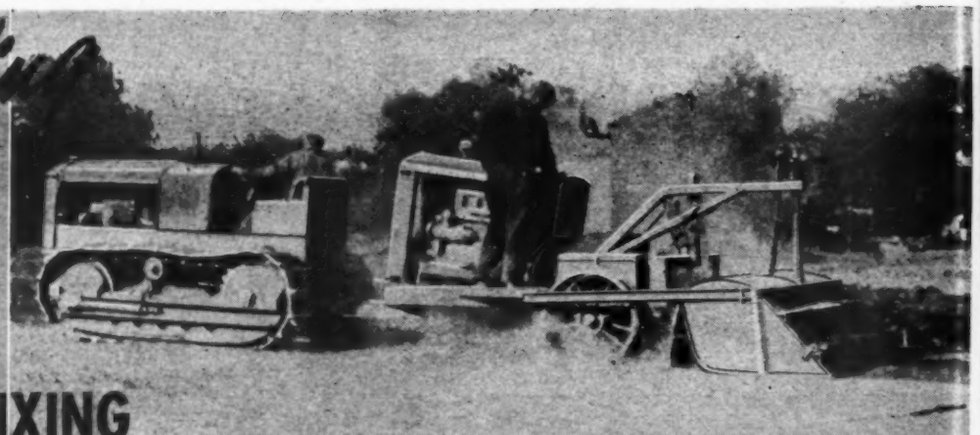
Call on your local Ward LaFrance dealer now and see the performance you have been looking for—reserve powered engine, gasoline or diesel; 85,000 pounds yield strength frame; special spring design; double reduction axles; air brakes; extra load capacity.

Look for the big truck with the exclusive "flat top" fender

WARD LAFRANCE TRUCK DIVISION
Great American Industries, Inc.

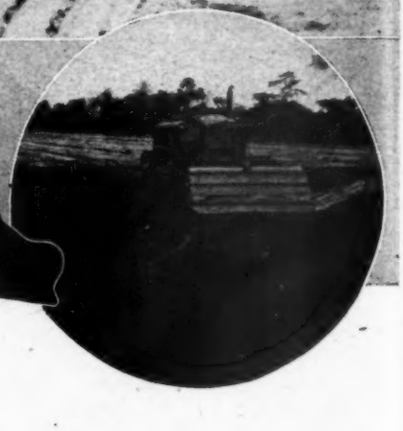
ELMIRA, NEW YORK

Blending BINDER AND AGGREGATE IRREGULARITIES by CROSS-MIXING



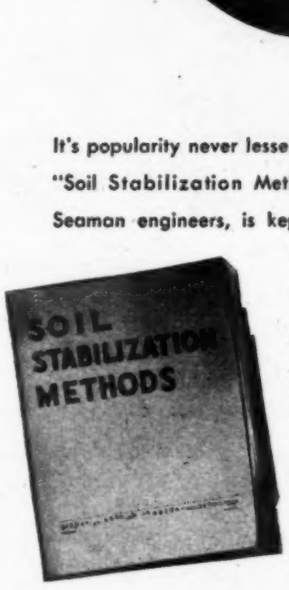
WITH THE

SEAMAN MIXER



WHEN aggregates vary,—as often occurs load by load, in pit run material and the fines and the coarse lie some distance apart . . . when, due to accidents in applying bitumen uniformly . . . when, even with uniform binder application the fines absorb more and the coarse material less,—all these irregularities are easily corrected by cross-mixing with the SEAMAN. Cross-mixing simply means operating the SEAMAN MIXER in zig-zag or crosswise as well as in the longitudinal directions. Due to the "carry" of materials within the hood of the SEAMAN, coarse material is then mixed uniformly with the fines and "rich" and "lean" spots in binder application are successfully blended. Furthermore, shut-downs because of excess moisture in the materials are greatly shortened when the SEAMAN is used,—for its inherent aerating action does a quick job of dehydrating. And in a bituminous mix,—the oxidation of solvents "sets" the treatment faster. What mixing equipment other than the SEAMAN offers such great versatility in economical operation?

It's popularity never lessens! The booklet,—"Soil Stabilization Methods" compiled by Seaman engineers, is kept up-to-the-minute with the latest information from the field. Write for your copy. Ask for Bulletin RS-25.



SEAMAN MOTORS, INC.

305 N. 25th STREET MILWAUKEE 3, WISCONSIN

PLANT MIX QUALITY AT ROAD MIX COST!

Try this for size . . . and boost payloads and savings

Here's a big idea that converts your medium-duty trucks to heavy-duty, six-wheel haulers.

It's the Thornton 4-rear-wheel Drive!

It boosts trucks of 15,000 to 16,000 lbs. G.V.W. to 26,000 to 32,000 as a truck . . . 42,000 to 44,000 as a tractor. Not only that—but it also enables your trucks to haul heavier loads of road materials and equipment *right to the job*—over bad areas, rough roads or paved highways.

This popular conversion unit includes a two-speed gear case assembly with a NoSPIN Differential—the automatic-locking differential that assures positive drive at all times. A NoSPIN Differential can also be installed in each driving axle to prevent wheel-spin.

The Thornton 4-rear-wheel Drive also includes an extra driving axle, to give you two instead of one. And you get two extra wheels, four extra tires, "walking-beam" springs, frame reinforcements and attaching parts. Because the load is spread over eight tires instead of four, far better flotation is assured.

Find out how this BIG idea can double your payloads. Call your truck dealer or Truckstell distributor. Or send coupon below. The Truckstell Company, Union Commerce Bldg., Cleveland 14, Ohio.

THORNTON 4-REAR-WHEEL DRIVE

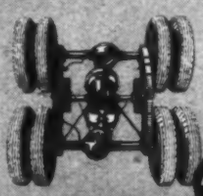
Converts a Medium-duty Truck

. . . into a Big, Powerful Six-Wheeler

RESULT: 100% More Payload
100% More Tractive Effort

THE NoSPIN DIFFERENTIAL used in the Thornton 4-rear-wheel Drive will also increase the efficiency of *4-wheel* trucks. Fits virtually any driving axle. Prevents wheel-spin . . . keeps trucks from stalling in mud, muck, sand and snow . . . on ice or on slippery roads.

FREE! Send for your free copy of new illustrated folder. Tells how the Thornton 4-rear-wheel Drive will help you solve your problems.



THORNTON 4-REAR-WHEEL DRIVE

Approved and distributed by TRUCKSTELL
SPECIALIZED EQUIPMENT FOR PLUS PERFORMANCE

Mfd. by DETROIT AUTOMOTIVE PRODUCTS CORP.
(Formerly Thornton Tandem Company) DETROIT, MICH.

The Truckstell Company, Dept. RS-6
1274 Union Commerce Bldg., Cleveland 14, Ohio

Yes . . . I want to know *more* about the Thornton 4-rear-wheel Drive, and how it will enable my.....(make) trucks to earn more money. Please send free folder and name of nearest Truckstell distributor.

Name.....

Address.....

City.....Zone.....State.....

For the *Toughest* Service on Powered Wheels

for Logging, Construction, Mining

New Angle Pulling Power •
More Rubber • Greater Traction

Squeegee Power Cleats • Ejection Action

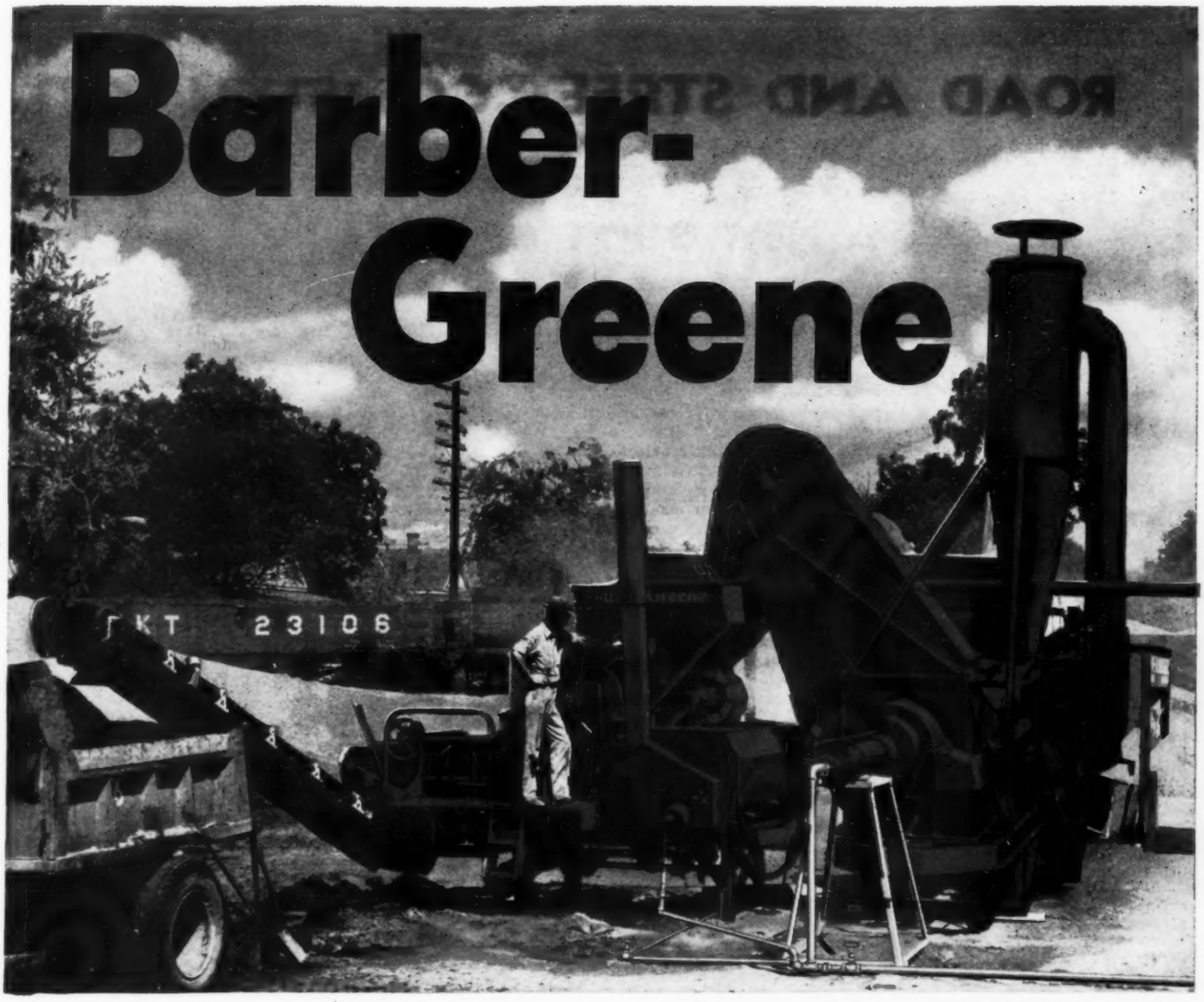
Snag-Resistant Tread and Sidewall •
Heavy Shock-Absorber Plies

Buttressed Highway Rib •
Reinforced, Extra Heavy Beads

Natural Rubber Impact Cushion •
Deeper, Cool-Running Shoulders

The GENERAL L.C.M.

THE GENERAL TIRE & RUBBER CO. · AKRON, OHIO



Typical set-up of the Barber-Greene Maintenance Plant. Various combinations to meet your immediate needs may be easily arranged.

This *Small* Bituminous Mixing Plant Does a *BIG* Job!

Here's a complete, easy-to-operate, small bituminous mixing plant! It is specifically designed for maintenance and repair work, small road building projects and a variety of other surfacing jobs. The B-G Maintenance Plant will handle any type of mix, and its capacity is remarkable, considering its size and portability.

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ROAD AND STREET CONSTRUCTION METHODS AND COSTS

A NEW BOOK OF DATA

By

HALBERT P. GILLETTE and JOHN C. BLACK

This book was planned expressly for use by contractors, engineers and highway officials.

It is not a textbook, but a compendium of data, carefully selected with reference to their usability by highway builders and other persons concerned with highway construction costs.

In general the data are of two main classes—dollar and cents costs per mile, per square yard, per cubic yard, and the like, for use in quick approximate estimates; and details of material, labor and equipment costs, with records of man-hours and machine-hours, for use in close estimating and in studies to reduce costs or improve methods.

The data are from a great number of different sources, and are in widely varying detail.

All major articles carry descriptions to show clearly the class of work and the methods for which costs are given, and to provide a basis for further reference and study if desired.

Location and date of job and the source of information are given in the title and introduction to each article.

The grouping of subjects in chapters is convenient, but an unusually complete index is furnished as the main guide to any subject or sub-subject sought.

The authors are both men of practical experience in highway and other construction. Both are members of the American Society of Civil Engineers.

OUTLINE OF CONTENTS

CHAPTER 1. INTRODUCTION—Brief discussions of construction costs, prices, profits and the uses of cost data.

CHAPTER 2. COST INDEXES—Indexes of the U. S. Public Roads Administration and Interstate Commerce Commission, with brief explanations of their construction, uses and limitations

CHAPTER 3. OVERHEAD COSTS—Separate discussions of the overheads incurred by contractors and by states, counties and cities.

CHAPTER 4. ENGINEERING—Data from states, cities and other sources on the costs of various kinds of surveys and other engineering. There are brief articles on aerial surveys and seismographic soil and rock surveys.

CHAPTER 5. RIGHT-OF-WAY—A general discussion followed by records of actual experience and costs.

CHAPTER 6. EQUIPMENT—This chapter contains several rental and ownership expense schedules in full detail, followed by articles on operating and maintenance costs, including records of fuels, lubricants, etc., a mathematical analysis of the problems of selecting and retiring machines, and a table of depreciation rates.

CHAPTER 7. LABOR—Schedules of established minimum wage scales and records of wage rates in various states; comparisons of contract work and day labor; convict labor costs and other pertinent matter.

CHAPTER 8. CLEARING AND GRUBBING—Records of clearing with tractor-mounted equipment, hand and horse methods, stump blasting, etc.

CHAPTER 9. GRADING—Eighty-four pages of articles on grading with power shovels, scrapers of various types and sizes, elevators, blade graders, bulldozers, etc.; hydraulic grading; rock drilling and blasting; winter grading; special swamp grading; minor operations and hand work.

CHAPTER 10. HAULING AND HANDLING MATERIALS—Studies of hauling operations on power shovel jobs, concrete construction and bituminous construction; truck movements at yards; industrial railways; team and wagon hauling; and other articles

CHAPTER 11. PRODUCTION OF AGGREGATES—Articles on labor requirements and costs of producing sand, gravel and crushed stone at various locations.

CHAPTER 12. UNTREATED BASES AND SURFACES—Waterbound macadam, crushed rock and gravel construction.

CHAPTER 13. STABILIZATION OF BASES AND SURFACES—This chapter is devoted chiefly to work with calcium chloride, articles on portland cement and bituminous stabilization being given in the chapters on concrete and bituminous construction.

CHAPTER 14. BITUMINOUS SURFACES AND BASES—The five parts of this long chapter contain articles on various methods in different states: Part 1. Surface Treatments; Part 2. Bituminous Macadam; Part 3. Mixed-in-Place Construction; Part 4. Traveling Plant Construction; Part 5, Stationary Plant Construction.

CHAPTER 15. CONCRETE SURFACES AND BASES—Contains numerous detailed records of construction. There are articles on work with 27-E pavers, 34-E pavers, tandem set-ups, batching, hauling, curing, joints, cement-bound macadam, soil-cement roads, stabilization, and other subjects.

CHAPTER 16. BRICK PAVEMENTS—Records of brick pavement construction from various cities and states, including an article on vibrated monolithic. Short reference to granite block

CHAPTER 17. SIDEWALKS, CURBS AND GUTTERS—Miscellaneous prices and details of construction.

CHAPTER 18. WALLS, FENCES AND GUARD RAILS—A brief chapter of data on these items of highway construction.

CHAPTER 19. BRIDGES AND CULVERTS—Cost data on a large number of steel, concrete and timber bridges and grade separations—also culverts of various types. There are two articles on pump installations for underpass drainage.

CHAPTER 20. TUNNEL CONSTRUCTION—Detailed descriptions and data on the construction of 27 highway tunnels in the West.

CHAPTER 21. GRASS, SHRUBS AND TREES—Several articles on plantings for landscape improvement and protection.

CHAPTER 22. MISCELLANEOUS—Data on pedestrian underpasses, street car loading platforms, truck weighing stations, catch basins and manholes, lignin binder, water pumping, signs and markers, traffic striping, parking metars, highway lighting, radio communication with snow plows, accident prevention, and weather and construction.

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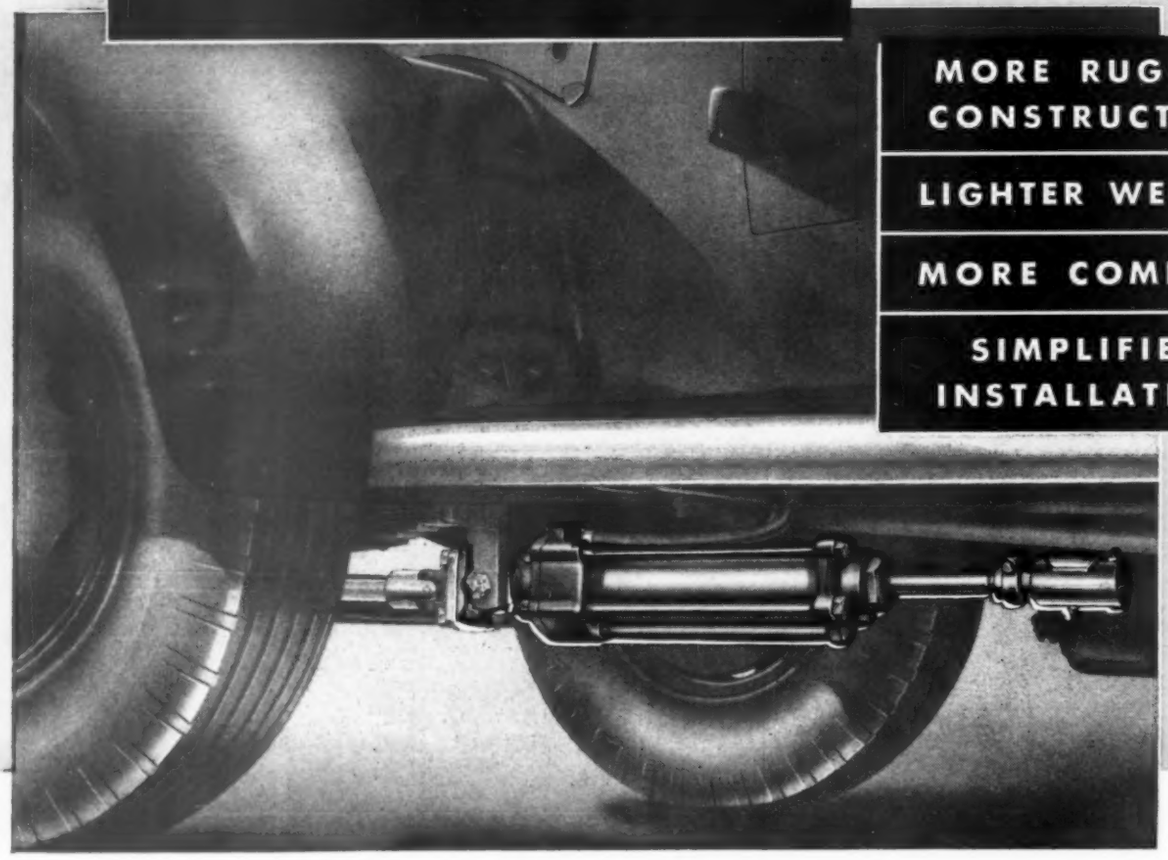

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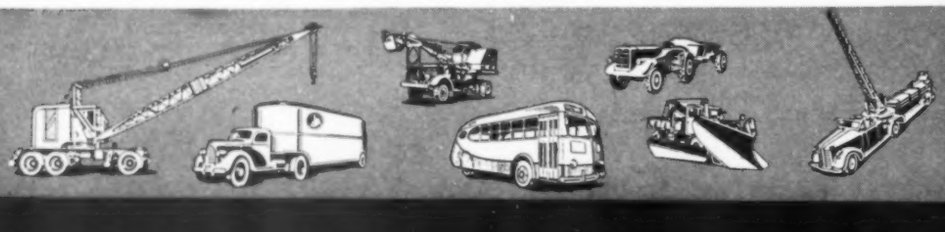

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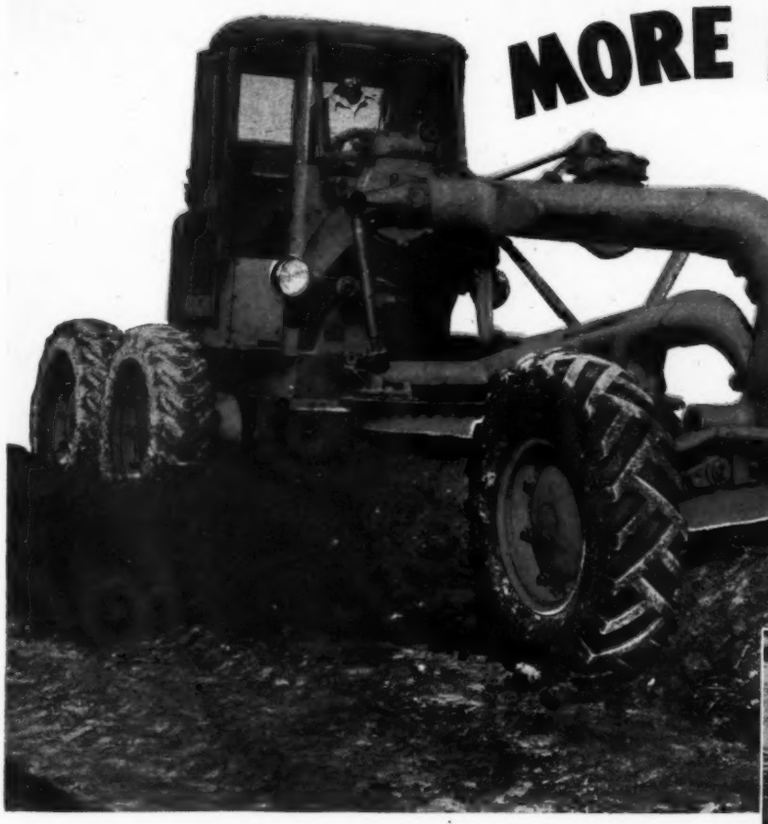

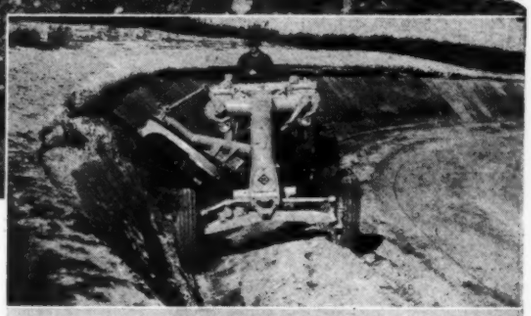

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Haul One-way	Tournapulls served	Haul One-way	Tournapulls served
300′	2	5,000′	7
1,000′	3	6,000′	8
2,000′	4	7,000′	9
3,000′	5	8,000′	10
4,000′	6	10,000′	13

PRODUCTION TABLE — DIRTMOVING		
Haul	Yards in 1 Hour	Yards in 8 Hours
50′	184	1472
100′	118	944
200′	66	528
300′	46	368
400′	35	280

Above production based on good working conditions, negligible grades, level cuts, efficient management and 60-minute-per-hour operating efficiency.

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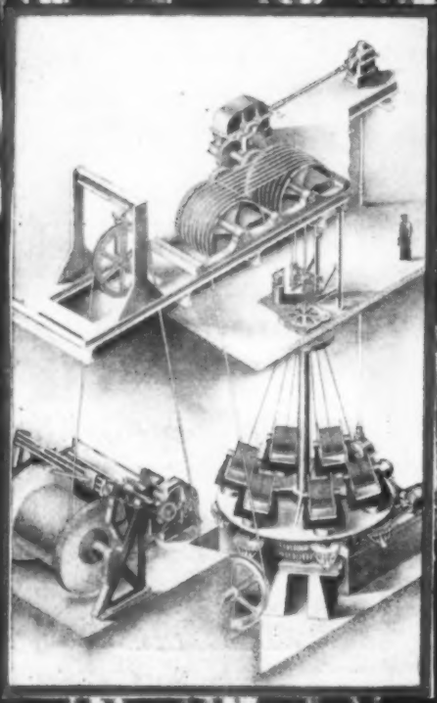

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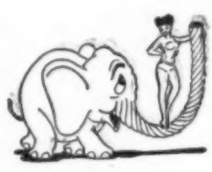

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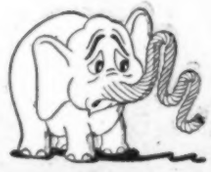

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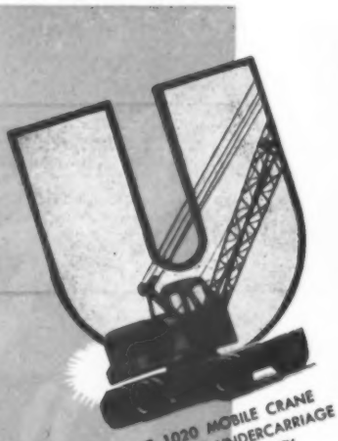

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WITH 3 AXLE UNDERCARRIAGE
10 TON CAPACITY

UNIT 1020 MOBILE CRANE
WITH 2 AXLE UNDERCARRIAGE
10 TON CAPACITY

UNIT 357 MOBILE CRANE
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UNIT 1020 TRUCK CRANE
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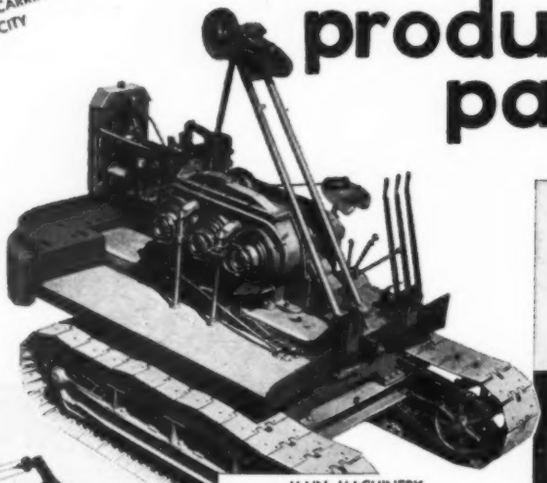

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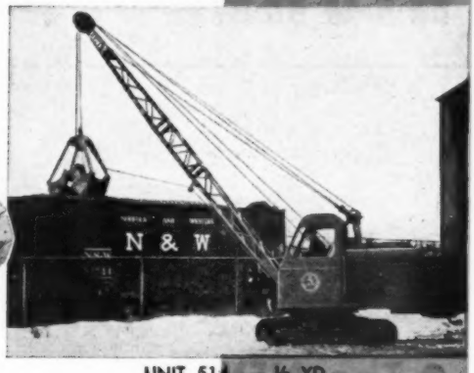

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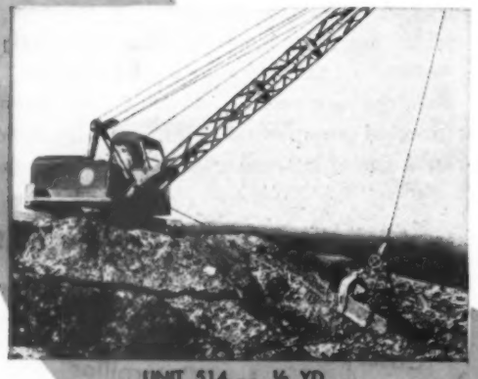

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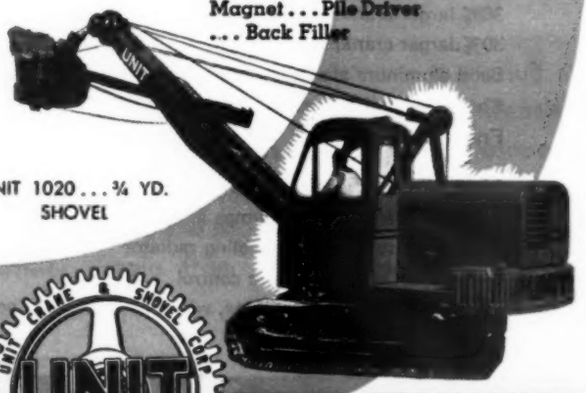

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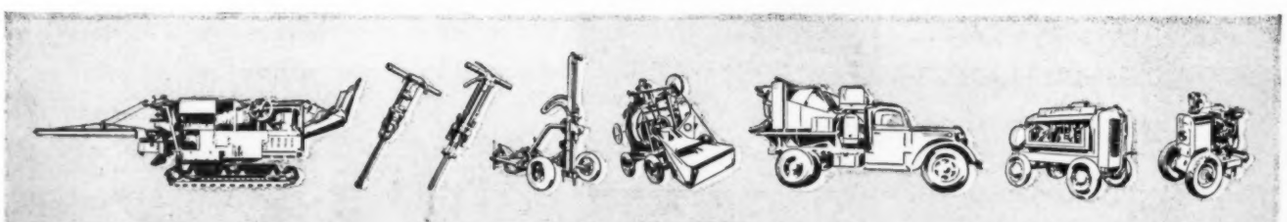
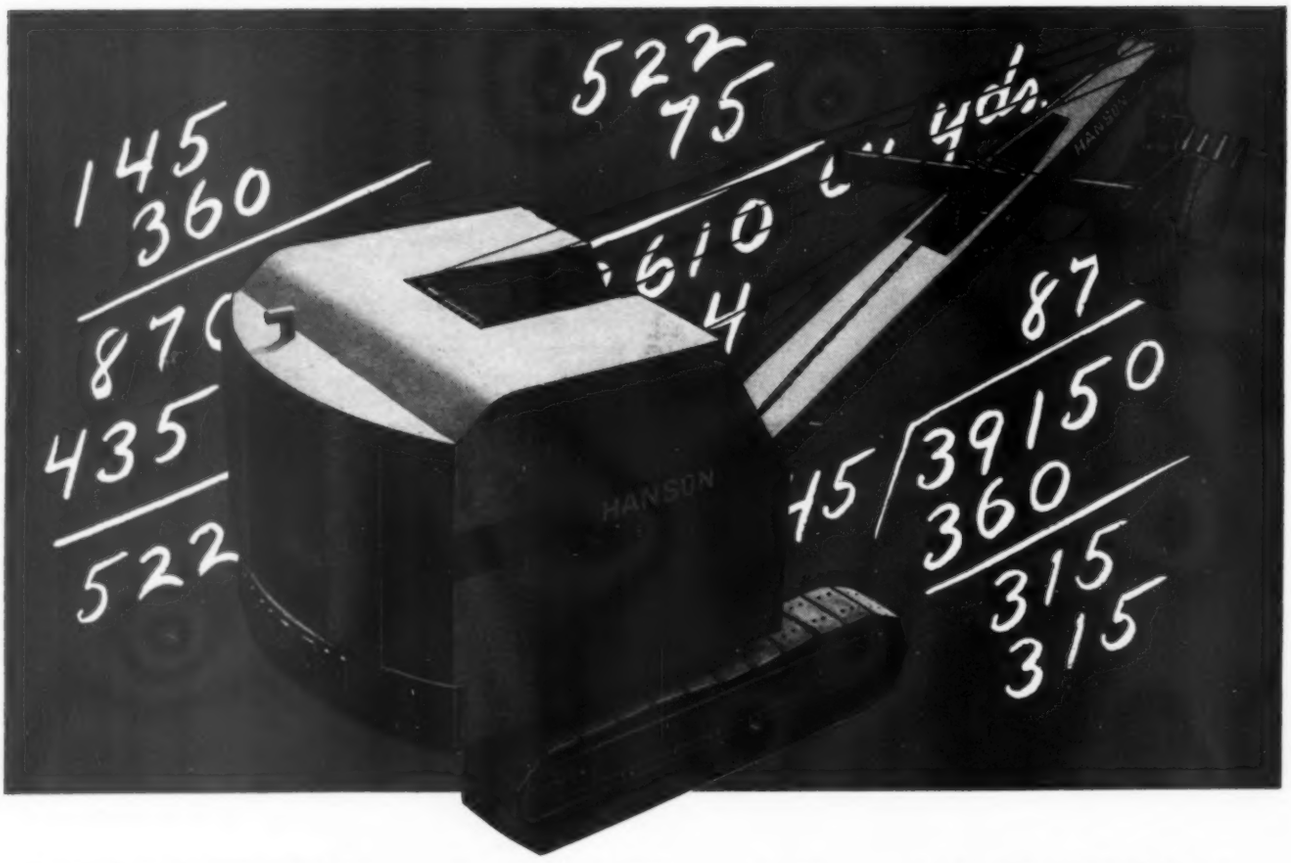


IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB



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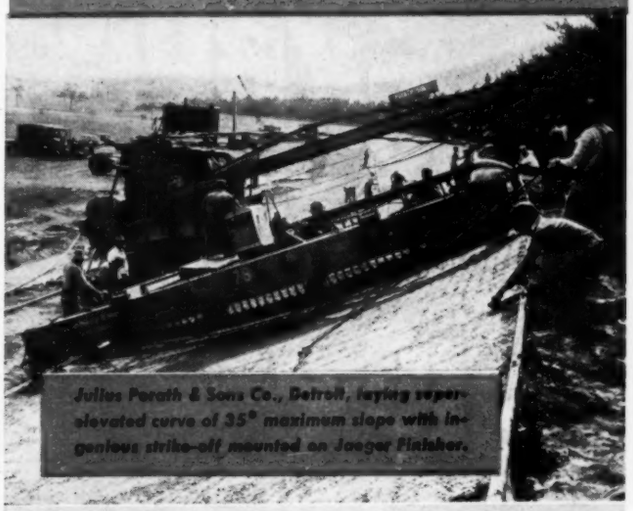
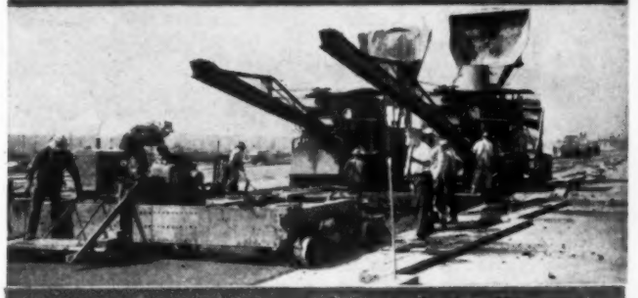


Julius Peratt & Sons Co., Detroit, laying super-elevated curve of 35° maximum slope with ingenious strike-off mounted on Jaeger Finisher.



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ROADS AND STREETS

JUNE, 1947 • VOL. 90 • No. 6

Is It A FAIR BID?

How One State Double-Checks on Contractors' Bid

What's OK for each item, in justice to the contractor and all concerned? The Arkansas highway department has developed a realistic system of unit cost analysis. Major items are independently computed; minor items compared with a weighted cumulative average of recent contract prices

By A. E. Johnson
Office Engineer, Arkansas State Highway Department, Little Rock

A PROJECT estimating method that regularly checks within the range of the three lowest bidders has been developed by personnel of the Arkansas state highway department. Used during the past twelve months, this method has been examined by contractors, who consider both the system and the resulting figures to be fair. Its thoroughness and accuracy have been cited by Public Roads Administration authorities. And PRA, incidentally, hasn't rejected a single Federal-aid project bid accepted by the state department. Estimating, of course, is not an exact science, but the method used by the department gives a reasonable cost for the project considered.

Highway department personnel developed this system from familiarity with material sources and from field experience on projects throughout the state. Early in 1946 we began using it informally based on pencil data sheets, from which finally evolved four sets of form sheets—one set each for Grading, Mineral Aggregate, Base Course, and Emulsified or Liquid Asphalt. The Grading sheets are reproduced herewith, accompanied by a brief discussion of their use and filled in with the estimate figures for a recent project.

Estimates incidentally aren't given out in advance in Arkansas, but are available for examination after award. They are employed as a yardstick to be used by the Engineering Department in judging proposals and in making recommendations to the commission as to making awards.

Differ From Contractors' Estimating Methods

In Arkansas, as in other states, the most successful long-established contractors keep costs very carefully. One of the larger earth-moving contractors, for example, "moves all his dirt on paper" before tendering a bid—outlining cut, fill and borrow areas on the plans with colored crayons and computing average haul distances and other factors. This is old stuff to contractors, of course, but I wonder how many of them painstakingly follow through on every set of plans they bid.

No two of our contractors have quite the same way of figuring. Rather they employ a combination of self-taught tricks and standard procedures taken from the handbooks of their contractors' association. But they do agree on one point: they tend to figure the whole job, then prorate their final or over-all cost to the various items. This has sometimes led to unbalanced bids, of course, but perhaps is smart thinking on the contractor's part, since it is the whole cost that makes or breaks him.

Grading, Example Sheets

In contrast, the state highway department's procedure takes item by item and comes up with a unit cost for each, making each item as nearly compensatory as possible. Let us go through the grading sheets, and discuss some of the details as we go.

Sheet I begins with space for entering quantities—total yardage in the job (1), the part that will be

Editor's Note—Details of estimate forms for types of road work other than grading will be published in later issues of Roads and Streets.

ARKANSAS STATE HIGHWAY DEPARTMENT

ANALYSIS OF COST
OF GRADING

Job 10298 Made by: J TP

F. A. Project S-179(3) Date 3-10-47

Quantity:

Kind of Excavation Common Cu. Yds. 250738 (1)

Percent of Yardage to be Moved by Grader 0 %

Net Cubic Yards to be Moved by Other Equipment 250738 (2)

Station Yards Overhaul Involved in this Item 41040 (3)

Character of Material Sandy Clay & Gumbo

Percent S.R. _____% (4) Percent Earth _____%(5)

Characteristics and Conditions:

Work: Heavy _____ Medium ✓ Light _____

Loading: Easy _____ Medium ✓ Difficult _____

Haul: Short _____ Average ✓ Long _____

Road: Firm _____ Fair ✓ Soft _____

Grades: Steep _____ Rolling ✓ Level _____

Effect of Wet Weather on Progress Impede _____

For Rock Only:

Work: Heavy _____ Medium _____ Scattered _____

Kind: Solid _____ Seamy _____ Boulder _____

For Embankment Material or Selected Material Only:

Clearing and Grubbing Required _____

Royalty per Cubic Yard _____ (6)

Dead Haul to Project _____ Miles

Total Royalty Cost: (Embankment Material or Selected Material)

(1) _____ x (6) _____ = $_____ (7)

★ Sheet I of "Grading" estimate form

moved with a blade, and remainder (2), overhaul involved (3), percentage rock and earth (4) and (5). Clearing and grubbing items are also entered farther on down, along with space to compute any material royalty involved, (1) times (6).

Actual Output Estimated

On Sheet I note the space set aside for describing the anticipated working conditions on the job. Will the work be light, medium, or heavy? Loading easy, so-so, or difficult? Haul short, or long? What about haul road condition and grades? Is the character of the project such that bad weather will seriously delay work, or not? These conditions help in Sheet III to estimate the average hourly or daily output that will probably be obtainable. Manufacturers' published figures usually are for steady work, whereas this form seeks to allow for time lost during the move-in and move-out, rain stoppage, cleaning tracks on tractors, repairs, waiting on other equipment, etc.

For example, take scraper output. The average actual observed output on numerous Arkansas contracts, divided by the number of days the scraper is assigned to the particular job, is about 350 c.y. per 10-hr. day, or 35 c.y. per hour. For 15-yd. scrapers the average figure is proportionately higher. These figures are increased or lowered for a given project estimate in the light of the condition data entered on Sheet I. The figures below the lines show the probable range of output or production per hour that will likely be achieved for shovels and compressors.

Truck haul capacity in cubic yard per day is figured by a formula (Sheet III) which allows 5 minutes for loading and dumping on each round trip, the 600 being minutes in a 10-hr. day. The 0.7 bed capacity is assumed as conservative. From this figure the estimator can then figure the average number of trucks or wagons the contractor will need (11) to keep up with a shovel of given capacity.

The last space of Sheet III is for computing the monthly output of the shovel or scraper equipment he will likely put on the job.

Then on Sheet IV the estimator can easily combine or multiply previous figures to get the time in months for completing the job. All these forms are made out for sizes and types of equipment most commonly used in Arkansas. Of course the contractor may have in mind new-type or special equipment, which is his privilege.

Machinery Cost Basis

Perhaps the most important part of the estimate form is Sheet II, on which is entered the common types of equipment and an estimated monthly machinery cost in Arkansas for each. The figure printed after each item is changed from time to time as necessary to keep it up to date. It represents the sum of 90% of the OPA rental scale for that machine, the AGC estimate for monthly repairs, the operating cost including fuel and lubricants, and the wages of the operator and other labor directly involved, such as oiler, etc.

This method is considered fair since OPA rental rates still apply in actual dealings (many contractors are still short of equipment and rent from each other).

Operating cost data for each type of unit are kept up on an elaborate work sheet in the highway department office. For example, in the case of a 1¼-yd. shovel this sheet lists the shipping weight of the machine, engine horse-power, hourly fuel consumption and fuel price, a pro-rata figure for oil consumption, etc. Average repairs per month for this size shovel (AGC figures) are added in, the combined salaries of operator and oiler (in this case $2.00 per hour

Equipment Rental, Repairs, Operation, Labor, Fuel, Lubricants per Month:

(Total cost figure includes all operators and crews needed except common laborers)

No. Required	Item	Total Cost	Amount
	2 1/2 C Y Shovel (Operator and Oiler Included)	3705	
	1 1/4 C Y Shovel (" " " ")	2906	
	1/2 C Y Shovel (" " " ")	1307	
4	15 C Y Scraper and 115 HP Tractor (Operator Incld.)	2102	8408
	10 C Y Scraper and 80 " " (" "	1618	
1	12' Pull Grader (Grader Operator Included)	563	563
1	Bulldozer Blade (80HP) (No. Operator)	142	142
1	80 HP Tractor (Operator Included)	1306	1306
1	115 HP Tractor " "	1548	1548
1	Heavy Duty Rooter (No Operator)	177	177
	Tandem Motor Patrol (Operator Included)	1096	
	4 C Y Dump Trucks (Driver Included)	907	
	7 C Y Dump Truck (" ")	1005	
	10 C Y Wagon Units (" ")	1754	
1	Pickup Truck (Foreman "	256	256
1	2-ton Flat Bed Truck (Driver Included)	504	504
	• 65 cf. Compressor & 1 Jackhammer (Hammer man and Compressor Operator	1526	
	• 160 cf. Compressor and 2 Jackhammers (2 Hammer men and Compressor Operator)	2648	
	• 315 cf. Compressor and Wagon Drill (Crew and Compressor Operator)	5772	
	Powderman	379	
1	Foreman	455	455
1	Mechanic	380	380
10	Laborers	182	1820
	Use for Selected Material Only		
	2 Drum Sheepsfoot Roller & 55 HP Tractor (Operator Included)	1084	
	Pneumatic Roller and Farm Tractor (Operator Incl.)	624	
	1000 Gallon Water Truck (Driver Included)	516	
	2" Centrifugal Pump and Motor (No tender needed)	71	
	Total per Month - - -	$ 15,559	(8)

• Includes Steel, Bits, Dynamite and Exploders

★ Sheet II

base scale, lower than for most states), and the final figure obtained.

For example, take the case of a 1¼-yd. shovel. The shipping weight is 777 cwt; motor hp. 115 (brake); diesel fuel consumption per hour, 5.17 gal. (0.047 gal. per hp.-hr.); fuel and lubricants per 260-hr. mo., $201.60; 90% OPA rental @260 hr., $978.00; AGC estimate for repairs, $309.00; wages of operator and oiler adjusted for overtime estimates @$1.25 and 0.75, $606.67. Total, $2,096 monthly charge.

This figure will be higher in most states, no doubt, due to higher salary scales and other items. But for Arkansas the current figure of $2,096 for this size shovel is thus a realistic one in the fullest sense.

Having these figures at hand as part of the form sheet, the estimator then goes on to consider the adjustment in monthly rate of each unit necessary to compensate for probable overtime. If the outlook is for running more than the 240 hours on which OPA rates are based, the monthly machine charge is increased proportionately; if a short month, decreased accordingly.

Labor costs on grading are estimated on a basis of actual payroll

Average Capacities Assumed for Equipment for the Duration of Operations:

Cubic Yards per Day per One C.Y. Capacity of Dipper or Bucket _____ (9)
(600 to 1000)

Cubic Yards per Day per Heaped C.Y. Capacity of Scrapers 40 (10)
(25 to 50)

315 cf. Compressor and Wagon Drill Unit in C.Y./Day _____
(350 to 700)

160 cf. Compressor and 2 Jack Hammers in C.Y./Day _____
(150 to 300)

65 cf. Compressor and 1 Jack Hammer in C.Y./Day _____
(75 to 150)

Capacity of each Truck or Wagon Unit in Cubic Yards per Day:

$$\frac{600}{\left(\frac{120 \times \text{Av. Haul}}{\text{Av. Road Speed}} + 5\right)} \times (0.7 \text{ Bed Capacity}) =$$

_____
Cu. Yds/Day/Unit (11)

Where: Average Haul in Miles Estimated at _____

Capacity of Bed in Cubic Yards _____

Average Road Speed in mph _____

Number of Trucks or Wagon Units Required:

(Capacity of Dipper Bucket in Cubic Yards) _____ x (9) _____ =

_____ _____
Units

(11) _____

Total Capacity of Equipment in Cubic Yards per Month:

Shovel or Dragline:

(Size in C.Y.) _____ x (9) _____ x 26 = _____ Cu.Yds.

Scrapers:

(No. Units) 4 x (Size-C.Y.) 15 x(10) 40 x 26 =

62,400 Cu. Yds.

Total Cubic Yards per Month 62,400 (12)

★ Sheet III—Explanation of above truck formula as follows: 10 hrs. x 60 min. per working day (600) is divided by a figure which consists of the fraction $\frac{60 \text{ min.} \times (2 \times \text{ave. haul in mi.})}{\text{Ave. road speed in m.p.h.}}$ plus 5 min. load and unload

figures from Federal-aid projects during the postwar period to date. Labor rates are relatively low in Arkansas, and rural labor conditions usually prevail. The highway department places no restriction on labor employment other than those required by the federal government, and that the scale be not less than the current posted minimums. Present minimums are 62 and 72 cents for common and intermediate labor and $1.00 for skilled. Common labor rates at present may range up to 80 cents and skilled from $1.25 to $1.50.

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Estimating Total Cost

Coming back to our form sheets, Sheet V provides space for combining all computed direct elements and adding in bond, insurance and other items for a final figure, to which is added the contractor's profit percentage. The overhaul portion is subtracted, leaving a unit excavation price per cubic yard for the project.

The procedure briefly described here was developed by the writer in cooperation with the field and office staff, under the direction of J. C. Baker, director of highways, and W. W. Zass, chief engineer of the Arkansas state highway department.

(See next page for Sheet V)

•

Pennsylvania Goes to Denser Topping Mix

Denser mix for overlays, higher ductility bitumen for surface treatment, are trends in current bituminous program.

Pennsylvania, like other states, has had trouble with high or ridged areas on bituminous overlays, where the joint filler in the underlying old concrete slab has extruded. The joints will show up through in time. Maintenance has been greatly reduced and most of the trouble eliminated by cleaning out the joint before resurfacing and not refilling it. This has been made feasible by going to a denser graded hot mix for the resurface, the greater density being accomplished by a slight increase in the fines. The new specification results in a more nearly waterproof job.

Dense grade mixtures also have another advantage. Serious stripping of the aggregates has occurred with open-type mixes, due to the easy access of moisture. This trouble was often associated with drag-type resurfaces. Today a dense-graded, machine-laid, hot plant mix is increasingly specified for resurfacing heavily traveled roads. During 1946 this type of mix was used on 64% of the state's extensive bituminous program, not counting surface treatment.

The trend is also toward more ductile asphalts and tars. For example, whereas formerly the state specified a float-test asphalt or an 80-100 float test tar, now 200-300 penetration asphalt and 180 float test tar is used. This higher viscosity has been a chief factor in doubling the length of the re-treatment cycle on farm-to-market roads, the program now being established on a 6-year basis instead of three years. Higher ductility material holds its liveliness longer.

Some credit goes also to a slight modification of the aggregate gradation, which has been made slightly more dense by increasing the requirement for the intermediate particle sizes.

Time Required in Months for Operation:

(A) For Common Excavation:

(2) 250 738 ÷ 9.1 Months (13)

(12) 62400

(B) For Embankment Material, Selected Material, or Solid Rock.

(1) _____ ÷ _____ Months (13)

(12) _____

(C) For Unclassified Excavation:

(2) _____ x (5) _____ ÷ _____ Months (13)

(12) _____

Then Solid Rock to be moved per day

equals (2) _____ x (4) _____ ÷ _____ Cu. Yds.

(13) _____ x 26.

Selected the drilling, loading and hauling equipment that will most logically handle this rock yardage under the conditions existing.

Use 7 C.Y. Trucks for heavy rock job and 4 C.Y. Trucks for light rock job.

Can loosened rock be loaded and hauled with scrapers? _____

If so, correct Item #2 under (C) to include the solid rock yardage.

★ Sheet IV—After entering (12), assume the solid rock contained in the Unclassified Excavation will be moved during the time the Earth Excavation is moved, since boulders, ditch lines and sub-grading are usually involved and the rock work cannot be finished before the earth grading is completed

★ Officers and guest speaker at Illinois Road Builders' Association spring meeting, Chicago—Herb Graffis, Columnist, Chicago Times; Donald O. White, Pres. Illinois Road Builders' Association. J. T. Callaway, Pres. American Road Builders' Association; Taylor Soper, Secretary, Illinois R. B. A.

$237,000,000 of Highway Contracts Let—Highway construction contracts awarded by state highway departments in the first four months of this year amounted to $237,070,000. Of this total $170,897,000 was for projects financed partially or entirely from federal funds and the remainder for projects financed without federal funds. In all 2,813 projects were let covering 14,598 miles of highway.

Total Estimated Cost of Operation:

Equipment, Operation, etc. (8) x (13)	$ 63,792
Cost of Materials (7)	
Cost of Moving In and Out (Estimated distance 140 Mi.)	3100
( )	
Plus 10% for Bond, Insurance and Overhead	6689
*Add'l Property Damage Insurance on S. R. Shooting	
*Add'l Expense for Watchmen, Barricades & Mats on S. R.	
Total Cost of Operation	73,581 (14)

(* When S.R. Excavation is in the vicinity of buildings or other improvements that might be damaged).

Estimated Unit Price per Cubic Yard:

(Estimated Unit Price for Overhaul per Sta. Yd. = _____ (15)

$$\left(\frac{(14)\ 73{,}581}{(1)\ 250{,}728} + \frac{10}{\text{\& Contingencies}}\ \%\ \text{Profit}\right) - \left((3)\ 41040 \times 15.02 \div (1)\ 250{,}728\right) =$$

$ 0.3217 per Cubic Yard

Use 0.32

★ Sheet V

Inexpensive Ditch Checks

An effective but low-cost type of ditch dam is being employed on the Texas farm-to-market highways. As shown in the accompanying photograph, it consists merely of a few shovels of mortar spread in the form of a low barrier. Spaced judiciously and protected by set-outs of grass at the toe, they have been credited with doing a fine job of erosion prevention along steep ditch slopes.

Some district engineers in the Texas department favor the smaller structures altogether, while others build quite a few large reinforced concrete dams where conditions seem to justify. This scene is near Austin on F. M. 20.

Designing Two-Soil Mixtures

Graphic method of determining proper percentages of two soil materials to obtain desired mixture

By George W. Shults
Atlanta, Georgia

TOP soil, sand clay, clay gravel, and pebble soil bases have been extensively used in roadways for many years. Increased knowledge and experience indicate, however, the need for adherence to the specifications governing the proportions of the various aggregates, clay, and silt within these bases. This trend has resulted in more exact specifications, analyses, and computations. Highway engineers have become more conscious of the materials that make up the bases, and more exacting as to the proportioning of these materials.

In cases where pits of desirable base material are found within limits of economical haul distance no mixing of materials is necessary, but in many cases the only pits available to the engineer are those containing material of unsatisfactory gradation which is deficient in coarse aggregate, sand, or clay. To obtain a more desirable base material the economical thing to do in a case of this nature is to produce an artificial mixture by blending the poorly graded material with a material which will make up the deficiency. The engineer is then faced with the problem of computing the quantities of each of the materials to use to obtain a desirable mixture.

The accompanying method of graphic computation of the proportions of materials to be used in producing a desirable mixture was devised by the writer and found quite helpful in every case where mixing was indicated. It is believed that this method of computation will be of value to engineers who encounter similar problems.

Let us illustrate the use of the accompanying diagram with a specific problem:

A—GIVEN:

Two pits within economical haul limits. Pit No. 1 contains an unsatisfactory graded pebble soil. Pit No. 2 contains a sandy material.

Sieve analyses of the materials are as follows:

	(PIT 1)	(PIT 2)
	—Per Cent—	
Retained on 10-mesh sieve	40.0	0.0
Retained on 60-mesh sieve	25.0	85.0
Retained on 200-mesh sieve	75.0	90.0
Silt	12.5	5.0
Clay	12.5	5.0

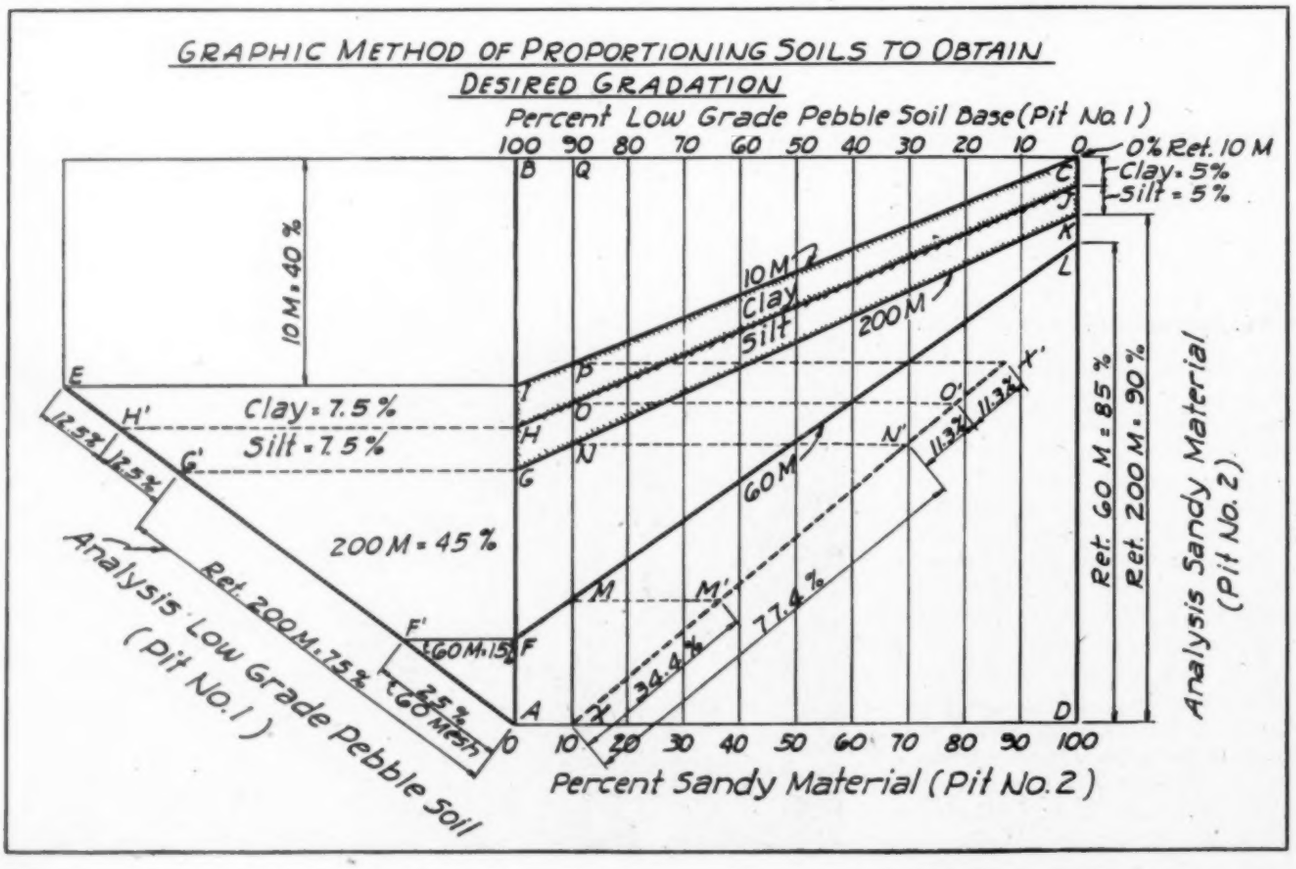
B—PROBLEM:

To determine the proper mix of materials from Pit No. 1 and Pit No. 2 to obtain a base material within the following limits:

	Per Cent
Retained on the 10-mesh sieve	20.0 to 75.0
Retained on the 60-mesh sieve	30.0 to 85.0
Retained on the 200-mesh sieve	60.0 to 85.0
Silt	5.0 to 15.0
Clay	11.0 to 23.0

C—SOLUTION:

Construct a square to a convenient scale such that one side of square


GRAPHIC METHOD OF PROPORTIONING SOILS TO OBTAIN DESIRED GRADATION
Percent Low Grade Pebble Soil Base (Pit No. 1)
100 90 80 70 60 50 40 30 20 10 0
0% Ret. 10 M
Clay = 5%
Silt = 5%
10 M = 40 %
10 M
Clay
Silt
200 M
Clay = 7.5 %
Silt = 7.5 %
12.5%
12.5%
200 M = 45 %
60 M
11.3%
11.3%
77.4%
34.4%
Ret. 200 M = 75 %
60 M = 15 %
2.5%
60 Mesh
Analysis Low Grade Pebble Soil (Pit No. 1)
Ret. 60 M = 85 %
Ret. 200 M = 90 %
Analysis Sandy Material (Pit No. 2)
0 10 20 30 40 50 60 70 80 90 100
Percent Sandy Material (Pit No. 2)

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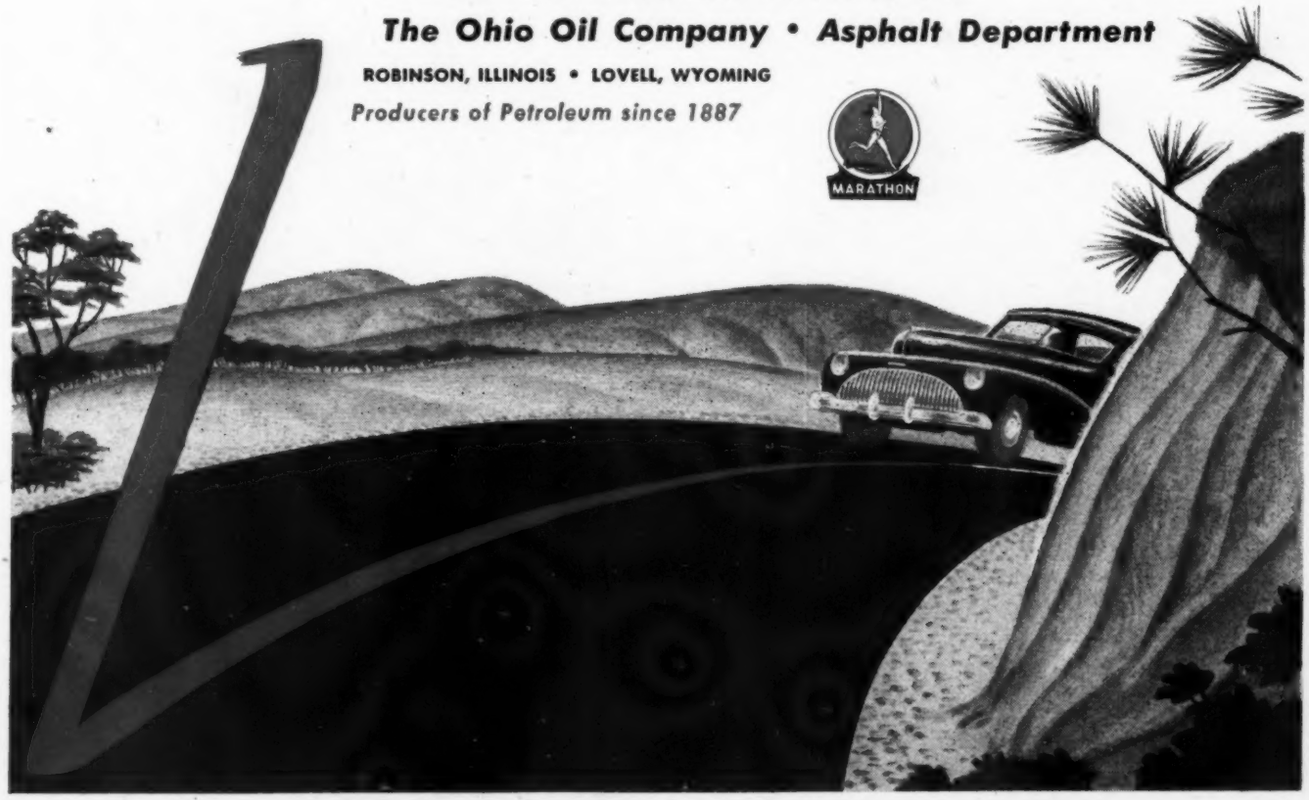


equals 100%. Convenient scales are 2 cm. equals 20% or 2 cm. equals 10% (this scale may be used to advantage on cross section paper).

Plot BI equals 40%, the material retained on the 10 mesh sieve in Pit No. 1.

Draw horizontal line to left from I.

Draw slant line AE to any length, calling its length 100% (7 to 8 cm. in accompanying diagram); E being located on horizontal line just drawn.

Plot percentages of materials in Pit No. 1 passing the 10 mesh sieve along this line as shown (AF; the 60 mesh material, equals 25%, and so on).

Project these percentages horizontally to line AB, i.e., project F′ to F, G′ to G, and H′ to H.

Then AF equals the *actual* percentage of 60 mesh material in Pit No. 1, taking into consideration the 10 mesh material, which was excluded when the analysis of the binder was determined. Likewise, AG equals the actual percentage material retained on the 200 mesh sieve in Pit No. 1; GH, the actual percentage of silt; and HI, the actual percentage of clay. The actual percentage of 10 mesh material is IB, which was previously plotted.

Plot along CD the percentages of 60 mesh, 200 mesh, silt, and clay materials in Pit No. 2. No slant line is necessary here, since no 10 mesh material is present in this pit. If 10 mesh material were present in Pit No. 2, the percentage of this material would be plotted on line CD down from point C. A horizontal line would then be drawn to the right from this percentage point and a slant line 100% in length drawn from point D to terminate on this horizontal line; then projections would be made from right in the identical manner as used on the left when actual percentages in Pit No. 1 were computed.

Connect actual percentage points located on line AB with corresponding actual percentage points on line CD, i.e., draw lines IC, HJ, GK, and FL.

Note that percentages along AD and BC denote the percentages of materials from Pits No. 1 and 2, respectively.

Select by inspection a trial mixture of material from Pits 1 and 2. Suppose a mixture of 90% from Pit No. 1 and 10% from Pit No. 2 is selected.

PQ is, then, the actual percentage of material in the mixture retained on 10 mesh sieve; XM, the actual percentage of material in the mixture retained on the 60 mesh sieve; XN, the percentage of material retained on 200 mesh sieve, and so on.

The 60 mesh, 200 mesh, silt, and clay materials must now be computed in percentages of the binder.

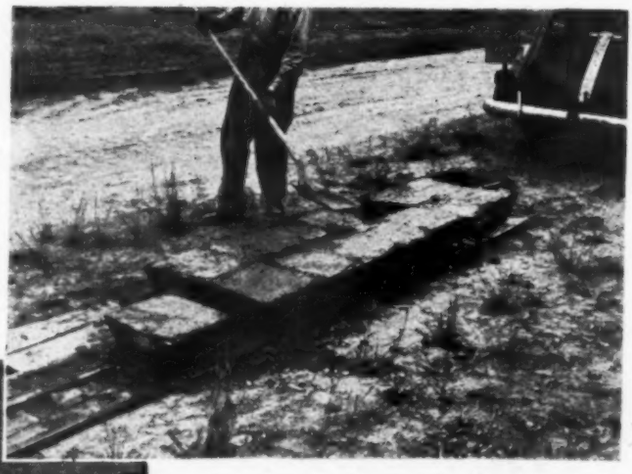
To do this, draw horizontal line to right from point P. Draw line XX′;

(*Continued on page* 74)

IT'S A FUNNY WORLD

How to Get Rid of an Unwanted Culvert

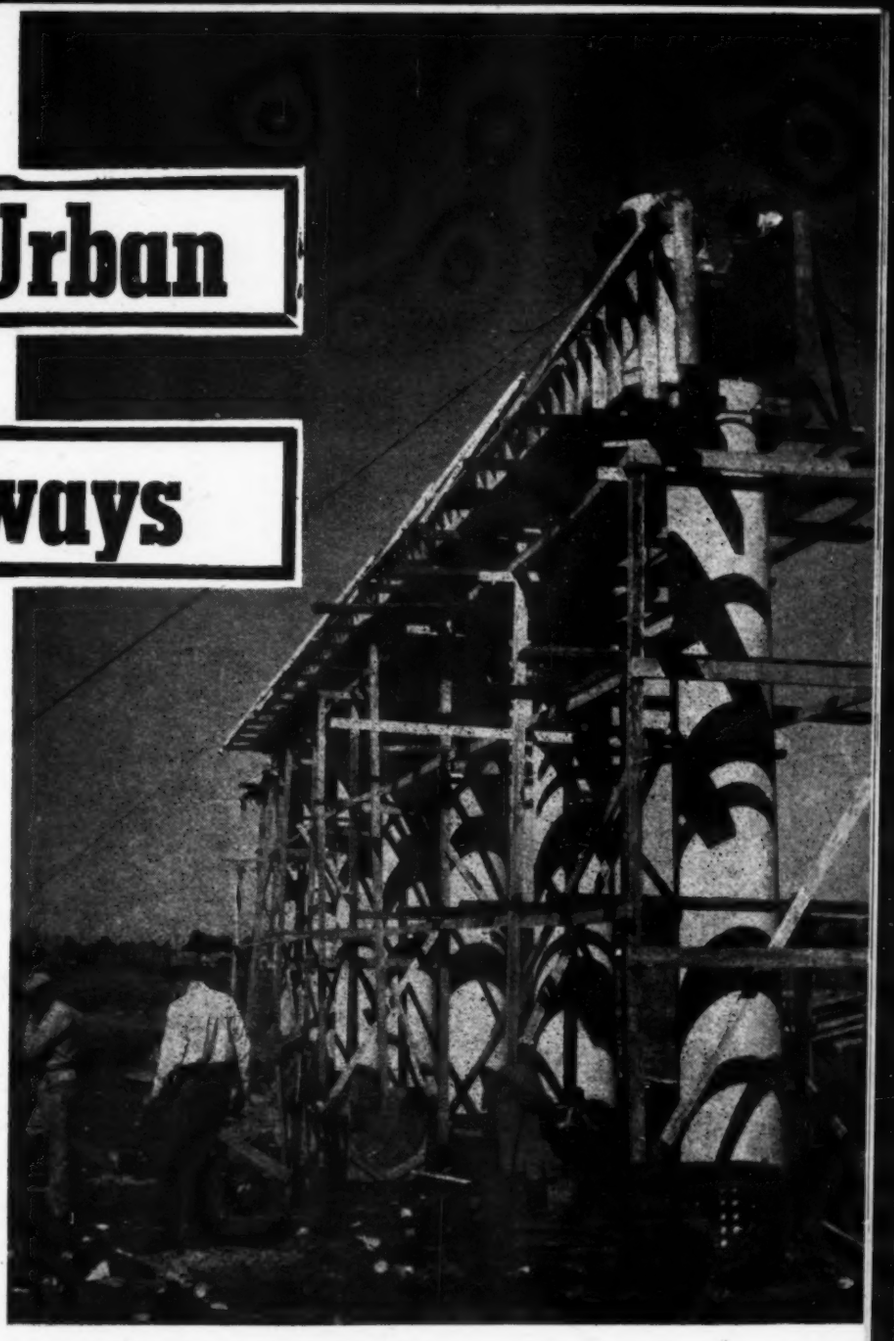
Ordinarily when some engineer takes a violent dislike to a concrete culvert, or decides it's in the way of some new construction project, he has it broken up and the rubble carted away. Or he salvages the chucks as rip-rap. Or he just buries it under a new fill, maybe. But here, what do we see but a half-busted culvert, and a big one, too, being hauled merrily along a suburban arterial to some distant disposal site. Apparently the contractor tried to break it up, then gave up and said, heck, let's put it on a flat-bed and take it away. Trailers aren't surprised at anything these days.



Not, Not Mud Pies

These over-size cookies represent a neat bit of thrift and enterprise on the part of an Oregon road contractor. They're pre-cast concrete blocks, made to sell to farmers along the highway, who grab them up at a good price to use as sills, foundation blocks, etc. The concrete used was salvaged from the ready-mix trucks whenever a few cubic feet was left after pouring curb sections along suburban US 99 near Albany, Ore.

Houston Urban Expressways



Smooth-walled circular columns will contribute to modern architectural appearance of Houston overpasses, but call for extreme forming accuracy

I—*This Issue*

- **Brown & Root, Inc., and R. P. Farnsworth & Co. in action on 4 contracts totaling $5,894,000 including award in May**
- **First roadway contract involves unique 4-street system with elaborate synchronized traffic signals**
- **Under-reamed bell footings saving time and expense on overpasses**

II—*Next Month*

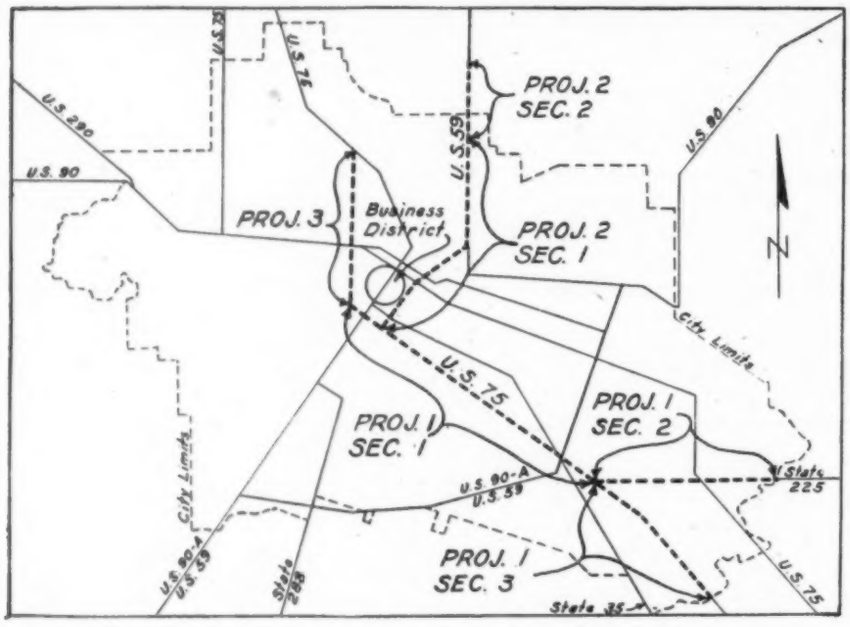
- **"Enclosed membrane" earth structure design and concrete pavement design result of thorough soils research and design procedure, described with extensive details**

By *Harold J. McKeever*
Editor, Roads and Streets

IF you were to visit the Houston urban expressway work right now you would find much to see, depending on your special interest.

But first a word about Houston and expressways in general. This city is in the midst of an old fashioned boom, with new skyscrapers going up all over the downtown section and new homes being contracted in hundred-lot clips. Houston population is said to be crowding the 500,000 mark and shooting for a million soon in the metropolitan area. Being a new-spirited city and not too hobbled by tradition, Houston is making actual construction progress toward that element now considered imperative to any large city's continued growth: modern big-capacity limited-access arterials. In short, expressways.

Houston's program has had its share of trouble getting under way.



★ Fig. A—Location of the Houston Urban Expressways initially planned in relation to the metropolitan area. Scheme consists essentially of three radials converging near the central business district

But today all agencies have united on a federal-aid program which is being carried out by the Texas highway department, under an engineer-manager with broad powers of initiative [See R and S, Nov., 1945].

The urban expressway plan calls for eventual construction of three radials, converging on the fringe of the downtown area in good expressway tradition. Project 1 takes in 4.8 miles of a location that will help carry U. S. 75 traffic into and through Houston from the Dallas-Houston axis from the north and Galveston from the southeast.

The main roadway will consist of six 12-ft. express lanes with a 4-ft. median strip, flanked on each side by a 10-ft. emergency parking shoulder of raised design, and a 32-ft. service road. As expressway traffic nears downtown it will fan out into a unique 4-street system, to be described herein. Elsewhere converging ramps will serve as underpass connectors.

All pavement is to be 8-in. uniform concrete on about 9-in. of flexible base. As a means of wrapping up the embankments, the sides and the base of fills and the compacted subgrade are to be sealed with a membrane of about 1.0 gal. per sq. yd. of liquid asphalt, and the flexible base in turn sealed with .3 gal. seal coat before concreting. See elaboration later on in this article.

The Project 1 expressway will be at grade except where it rises to overpass height at seven through-street or railroad crossings. Overpass structures will be notable for extremely modern and effective architectural treatment.

Right-of-way for the first 3.5 miles has been purchased for a total of $1,800,000. Over 200 houses have been moved from one 1.17-mile section, and today the line-up along Project 1 is like this (see map):

Contract 1—1.10 mi. of grading, storm sewers, pavement and signal system on four parallel streets; awarded Oct., 1946, to Brown & Root, Inc., of Houston; $1,052,400.

Contract 2—Storm sewers for 2.2 mi.; awarded Nov., 1946, to R. P. Farnsworth & Co., of Houston; $1,328,000.

Contract 3—1.17 mi. of expressway, including grading, flexible base, pavement, two overpasses, and lighting; awarded Dec., 1946, to Brown & Root; $2,262,400.

Contract 4—Awarded May, 1947; 65 mi. complete roadway except sewers, with two overpasses; $1,242,000; Brown & Root.

Contract 5—Probably to be let in September; .7 mi. overpasses and related roadways; $1,200,000.

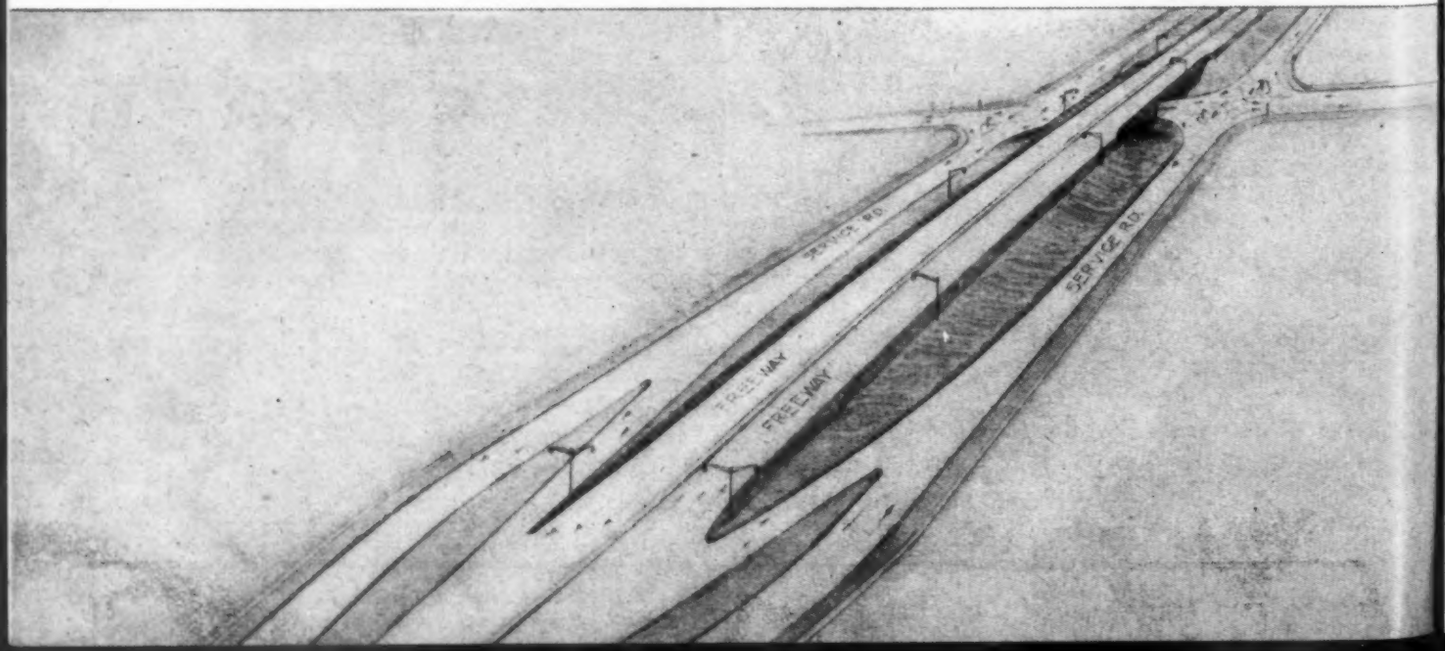
Contract 6—Probably early in 1948; 2 overpasses, related roadways, lighting and signals; $1,400,000.

An interesting detail of present contracts is the provision that the contractor do his own staking. In contrast with the policy of most state highway departments, which often furnish elaborate location and elevation detail sheets, only outer-edge reference stakes along the service roads are being furnished the contractors.

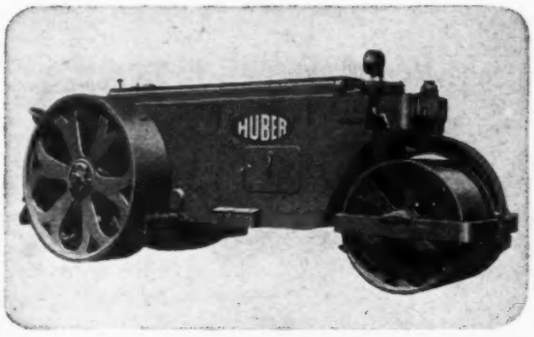
Unique 4-Street System

Unique in current urban expressway projects of this country is the 4-

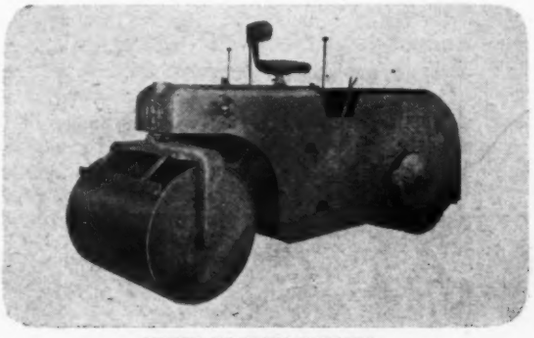
★ Wayside Drive Overpass—one of seven structures required for Project 1—showing typical ramp design and general layout



A "Ringer" EVERY TIME



HUBER 3-WHEEL ROLLERS
Automotive type, built in sizes from 5 to 12 ton.



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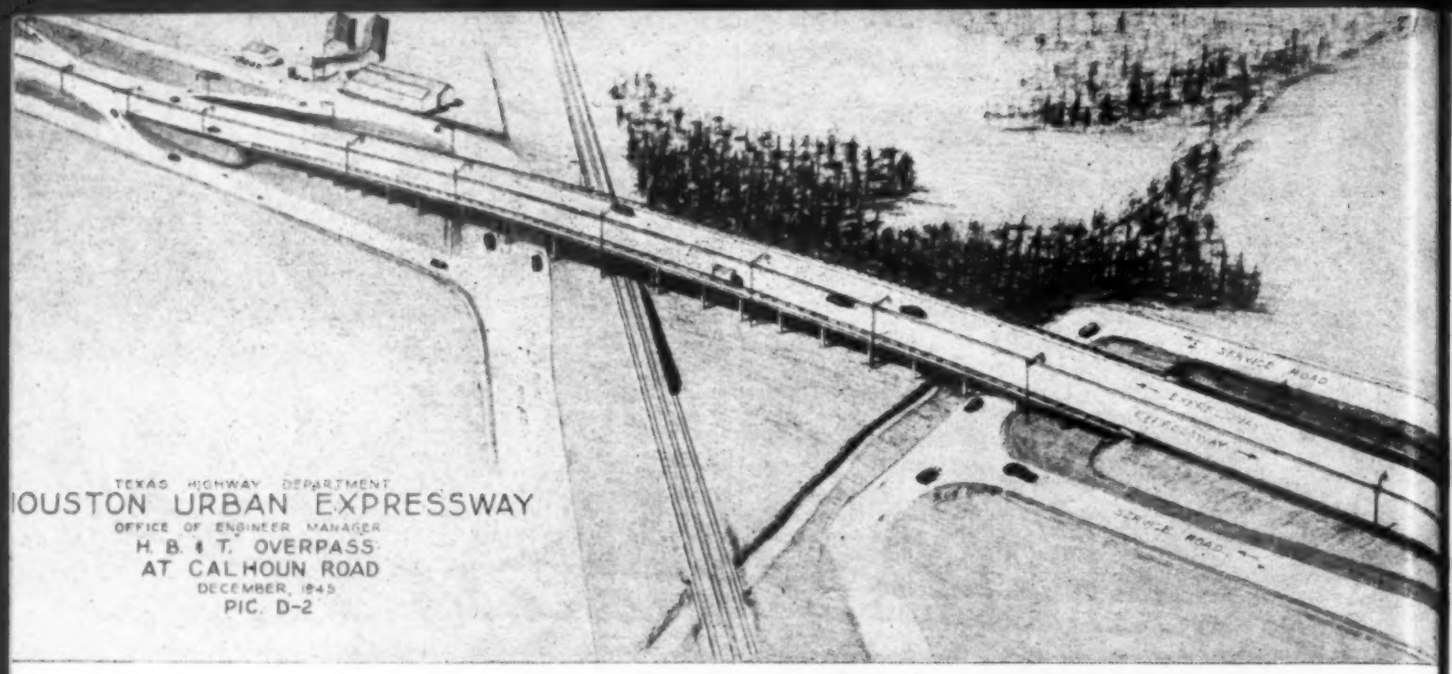


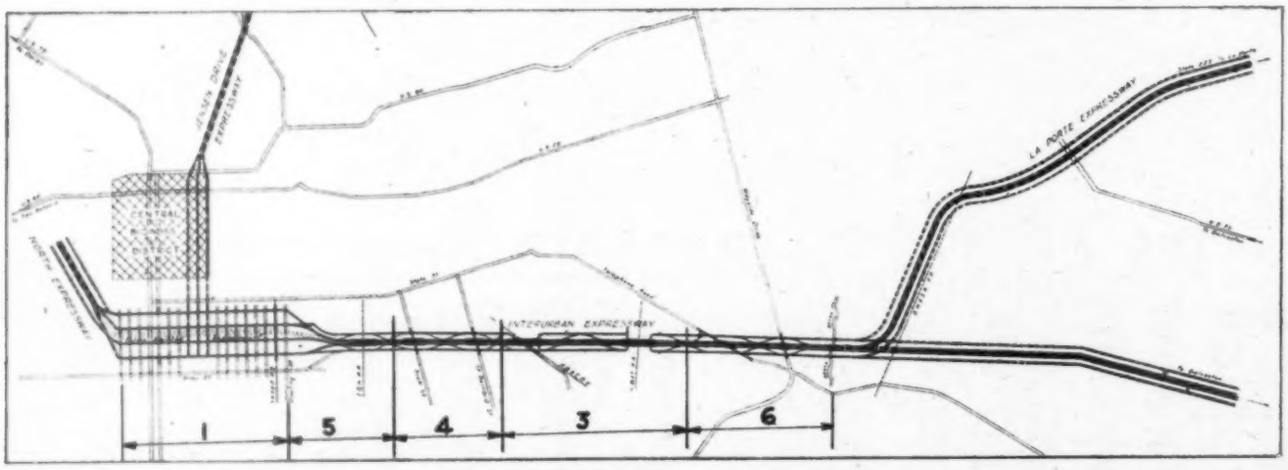
★ One of several rail overpasses

★ Ditch enclosure (60-in. corrugated metal pipe) part of heavily paved detour road along one expressway contract

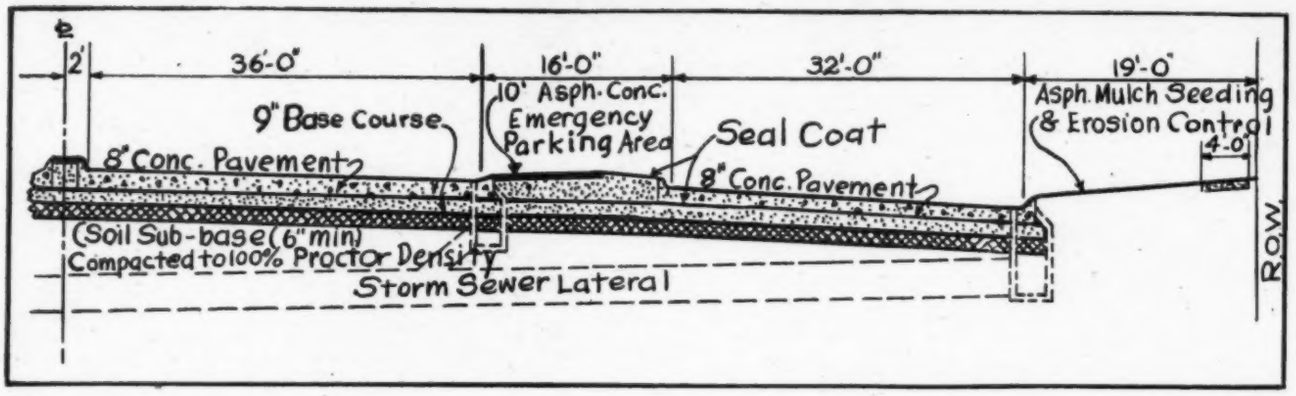
street system involved in the near downtown portion of Project 1. This scheme was selected rather than resorting to a single elevated or depressed roadway, because of the large number of elaborate ramps and entrance roadways the latter plan would have involved.

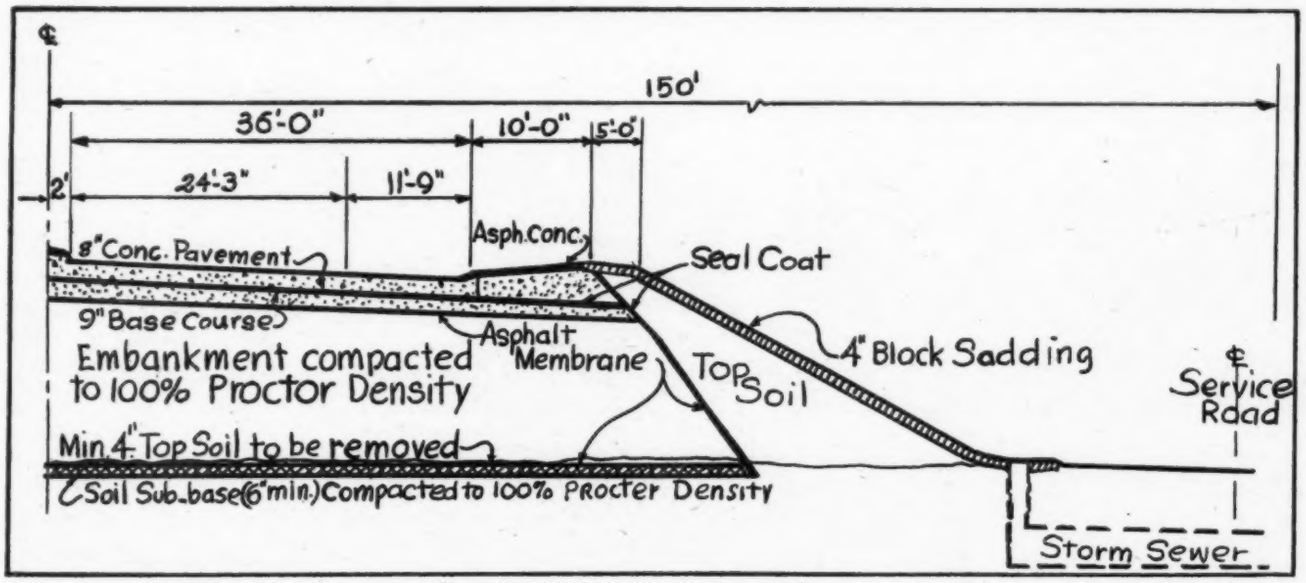
The 4-street system will be at street grade level crossing eighteen north-south streets on a location some ten blocks south of the center of the business section and will merge at each end into expressways leading from northwest to southeast across the city. The streets will each have a minimum width of 52 ft. providing three 12-ft. moving traffic lanes and two 8-ft. parking lanes on each street. The two northerly streets are to be westbound, and the two southerly streets eastbound. Both right and left turns will be permitted at all intersections for traffic leaving the 4-street system. Traffic entering the system from cross streets will turn only in the direction traffic is moving on the system.

Traffic analyses indicate that by 1957 the expressway traffic entering and leaving each end of the 4-street system will be 60,000 to 70,000 vehicles per day. Approximately 25,000 of these vehicles will pass directly through the system from one expressway to the other and 95,000 to 115,000 will enter and leave to the north and south. Approximately 200,000 vehicles will cross the 4-street system on the 18 north-south streets. These traffic volumes require extensive control features to avoid undue delays during peak load periods which will be only partially coincident on



★ Fig. 8—Project 1 and extensions, showing location of 4-street system and contract sections let to date





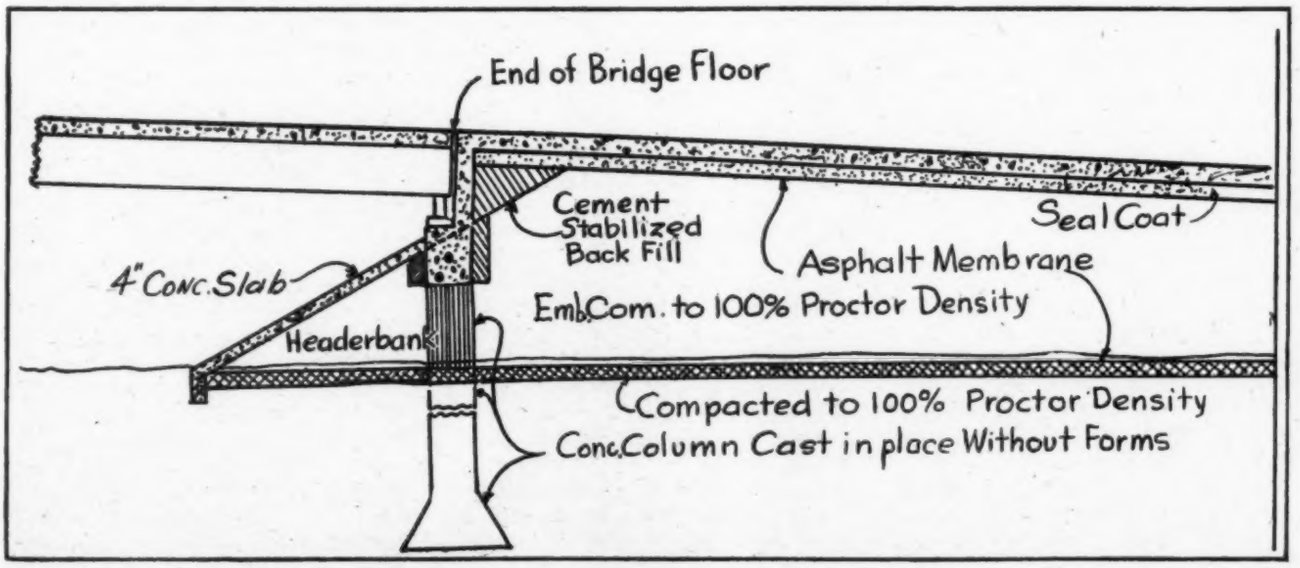
★ Fig. C—Typical cross section at ground level, on fills and at bridge ends shown on this page

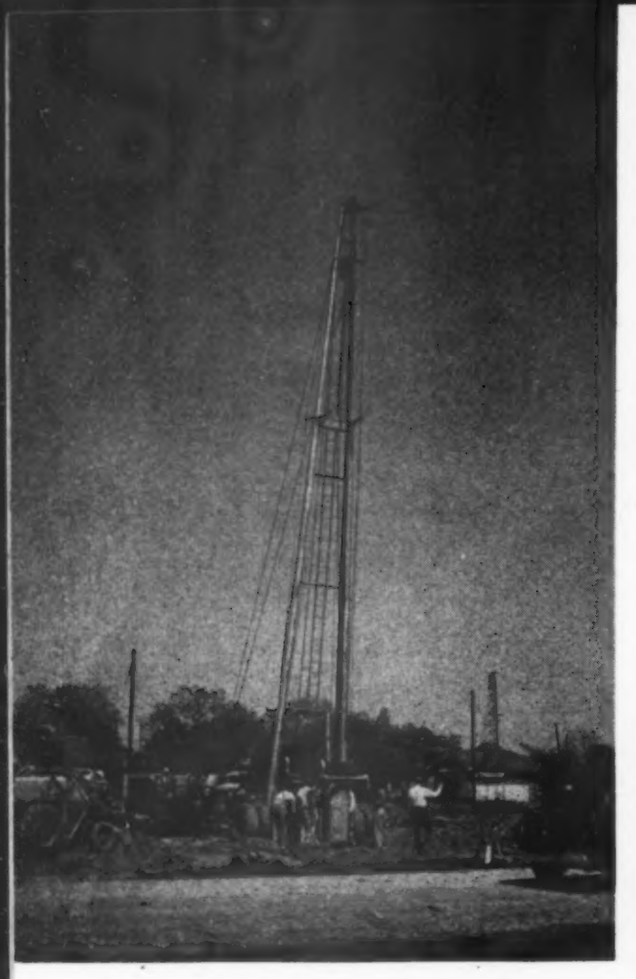
the east-west 4-street system and the north-south streets.

The present contract includes storm sewers, pavement repairs and widening, new pavement and traffic control signals, about $300,000 being for the traffic signal control system. There will be 64 signalized intersections on the four streets which will have a total length of 4.5 miles. It is believed that this system sets a nationwide precedent for a single signal installation. It is the first instance of Federal participation in a major traffic signal system.

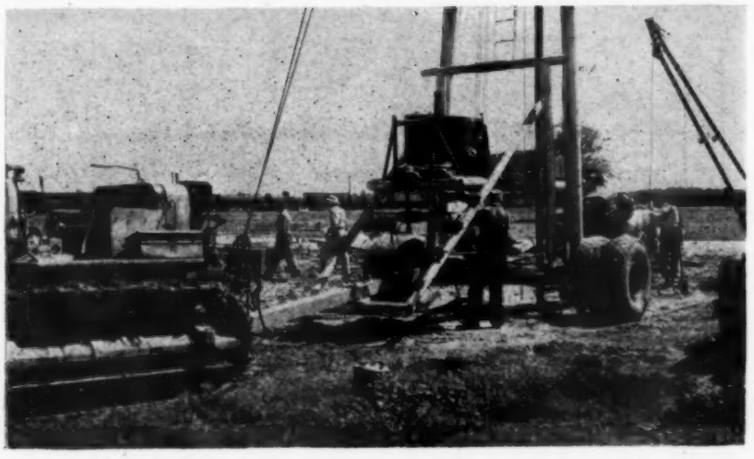
Details of this novel project will be described in greater detail in a later issue of ROADS AND STREETS.

Perhaps the most interesting construction procedure seen at this early stage is the use of a power soil auger





★ General view of the under-reamer rig, built by a Texas organization for Brown & Root, contractors



★ Note the stiff clay which makes possible individually bored footings for most of the overpass structures. Axle and wheels are from a scraper; gasoline motor on platform turns the auger and under-reamer shaft via chain drive; tractor winch raises and lowers the shaft

and under-reamer for overpass foundations on Brown & Root's Contract 3. The overpass structures are to include a large number of 50-ft. I-beam deck approach panels, supported by 7-column concrete bents. The columns are of cylindrical design, and the unusually small (30-in.) diameter of column will contribute to the light, sweeping architectural effect. The soil in the area of the Brown & Root contract No. 3 is a stiff A-7 clay and it was found feasible to adopt individual belled or flared column footings on hardpan, in place of pile bents or footing-and-foundation-pile design.

Use of the deep belled footing capitalizes successful Texas experience with power methods of quickly excavating and concreting such footings. Brown & Root's under-reamer is one of several similar pieces of equipment known to be in existence in the immediate area. Manufactured by R. W. McKinney, of Nacogdoches, Texas. It consists (see photos) of a gasoline engine driven vertical rotary rig, tractor drawn and mounted in this instance on the axle and tires of a discarded scraper. The frame is sufficiently high to permit boring holes to 40-ft. depth. An ordinary power soil auger of diameter desired is used. The auger is lifted periodically by a winch line from the tractor and the waste material taken away up by a light front-end loader.

After sufficient holes are bored to complete one day's work, the auger is removed from the rotating shaft and replaced by the under-reamer. This unit consists of a steel cylinder the size of the bored hole, into the walls of which fold two hinged wing sections. These wings are made to flare out gradually and act as cutters as the under-reamer is lowered through the bottom few feet of the hole. On Contract 3 the footings were being belled to from 6.5 ft. to 7.5 ft. diameter to provide the footing spread desired. The reamer wings are toggled to a 1,000-lb. kelly bar, which with the additional 400 lb. weight of the reamer is sufficient to cause the reamer to lower gradually of its own weight as it cuts, and to fan out progressively as it operates, creating an arc-shaped initial cut (see plan detail).

From the standpoint of shear stresses the ideal footing flare is, of course, prismatic, and reamers have been made which closely approximate a prism shaped flare. Brown & Root tried one at first, but later resorted to the equipment pictured, using an air or hand spade to modify the reamer cut (again see plan detail). A man is lowered on a winch line and in about five minutes trims the flare, loosened material being caught on a canvas sling and hoisted out.

The two overpasses on this contract involve about 350 holes running usually to about 18 ft. of depth. Deeper footings were first specified for bents adjacent to rail lines, but the design was changed to provide a wider flare rather than extra depth, in order to avoid ground water and sloughing off of the shaft walls.

6-7 Holes Per Day

During the first 30 days of operation with this outfit the contractor bored and reamed 168 holes, putting down as high as 7 holes per day with a 6-man crew. In other words, the under-ground work for 24 bents of a 6-lane bridge was completed in a single month by this one simple unit. The working area is kept clean. There's no clamshelling, sheeting, footing, forms, pump installations, backfilling or other "messing around" common to pier footings. Engineers and contractors on the job agree that

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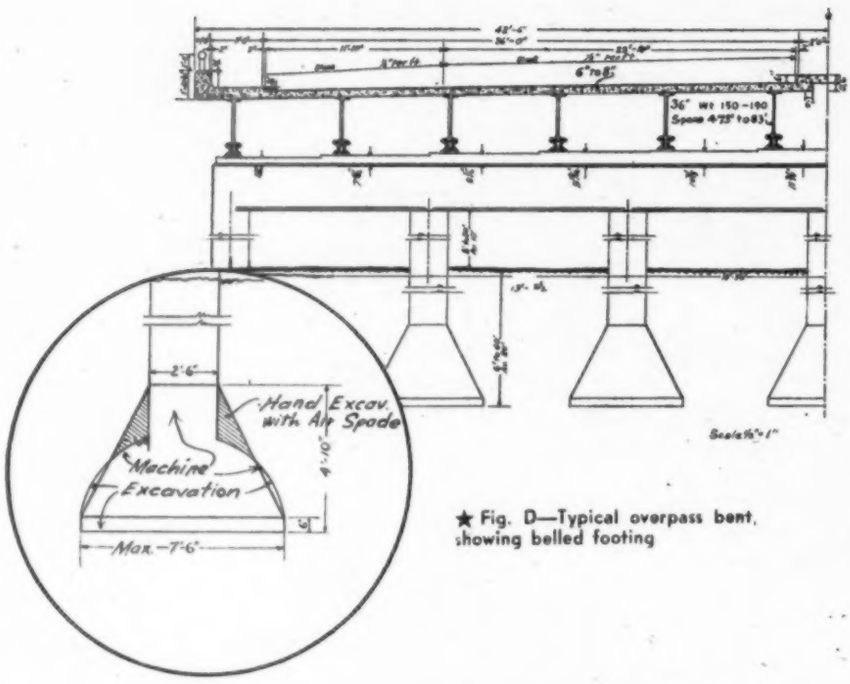


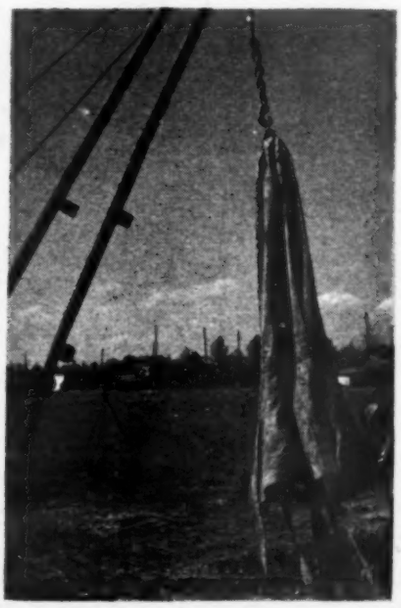
★ Fig. D—Typical overpass bent, showing belled footing

the procedure is saving from one-fourth to one-half the cost of alternate types of bent construction. The work has been simplified by the watertightness and stiffness of the clay. The under-reamer method is only applicable in stable soil with low ground water, and conventional shallow footing slabs will be required on other overpass contracts pending.

The depth of footing required for each bent was determined by 4-in. cores during preliminary design studies, and from soil samples taken from a smaller hand-bored pilot hole on the axis of each bent.

As the boring work progresses, footing soil tests are made by sampling one hole of each bent. Sampling includes taking a 6-in. diam. by 12 in. undisturbed sample with specially devised equipment which is sent to the laboratory for a tri-axial test for shear strength and other characteristics.

Each hole is bored with a 2-in. lee-



★ Earth spaded loose in trimming out footing (see drawing) is caught in a canvas sling. Sling is hoisted up through hole by a boom and winch mounted on a truck, and dumped by fastening hoist hook to a ring in bottom of sling

★ Details of the under-reamer. (Left): In raised position with cutting wings opened out for hand-shoveling away of excavated material; a circular metal plate has been placed over top of hole to keep dirt from falling back in. (Center): Side view of cutting wings in closed position, just after raising with a load of loose earth from the belled bottom. (Right): Wings dropped, earth shoveled away—note cutting edge on forward side of wing, and toggle bar connecting with vertical kelly bar

★ Footing collar is trued and bolted to accurate diameter in a wooden template frame before setting

★ Two-ft.-high circular steel collars are set with 1/16-in. accuracy over footing holes, being cross-checked on two transit axes. Footing is poured to height 6 in. above bottom of collar, and dowels positioned

★ Showing a completed footing, ready for steel column forms which will be slid down 6 in. over footing and clamped tight

way as to accuracy of location, the centerline of the auger being spotted with a transit. Close behind the reamer, a crew sets a 2-ft.-high prefabricated steel form collar in the top of each hole, the collar having been given a final truing up on a portable platform and truing frame where bolts are tightened to draw it to the exact diameter. The collar is then set with a transit check on two axes, column reinforcement assembly is lowered and set, ready-mix concrete tremied and vibrated, curing canvas placed, and the footing is done. Concrete extends 6 in. up into the collar.

Column footings are thus located to 1/16-in. accuracy, and later the column crew removes the collar and begins erection of above-ground forms.

Bent Construction Simplified

Bent construction is also marked by simplicity of operation. Plain-walled cylindrical concrete columns are formed by specially designed steel sections, three sections to a column. Column caps are formed with high accuracy by referencing the wood forms to parallel strut-connected angle bar supports along each under corner, these bars being painted yellow for quick visibility to the workers and transitmen. Excepti nally heavy 2 x 6 studs and 4 x 4 walers insure the forming accuracy required for the caps.

No form ties extend through the body of any column or cap. The only ties used in the cap forms consist of combination threaded strut and tie bolts above the pour, which hold the top form edges secure. The 1⅛-in. anchor bolts are held in stout wood framing, again with extreme accuracy.

Column steel consists of eight 1-in.-sq. bars with ¼-in. hooping on 2-in. ctrs.

All surfaces are cotton mat cured and rubbed. The contractor is investigating mechanical methods of rubbing cylindrical surfaces, but meanwhile has employed hand rubbing. Ready-mix is also being used for bent and deck construction.

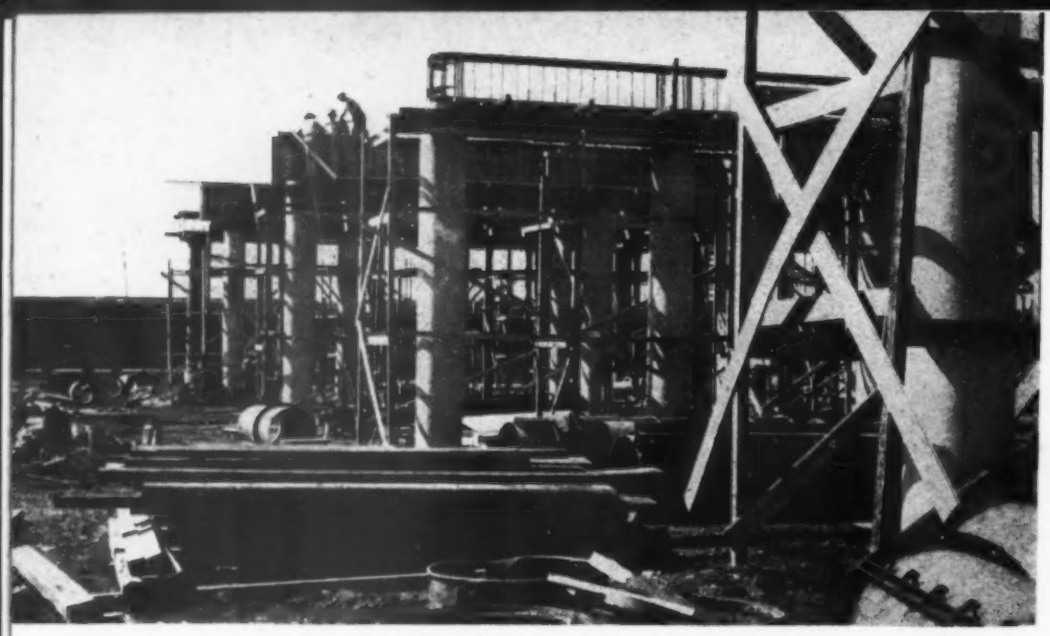
Tunnel Sewer Under Railroad

One of the two overpasses on the Brown & Root Contract 3 project includes installation of a 42-in. concrete pipe storm sewer under rail lines, part of the R. P. Farnsworth & Co. sewer contract along this section. Pipe was threaded under the railroad through a 56-in. segmental-plate corrugated shield, installed in tunnel by the Armco organization acting as subcontractor.

The bulk of the 36 to 60-in. concrete pipe sewer lines being placed by R. P. Farnsworth & Co., involves standard open trench construction. Mechanical ditchers and air-tampers are expediting trenching and backfilling.

Brown & Root Sections 1 and 3 are being directed by Howard Payne, project manager for the contractor,

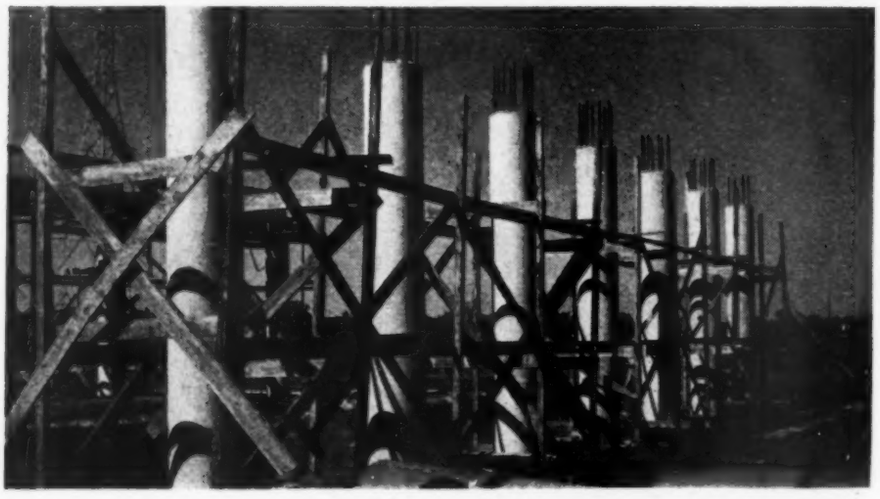
★ Jeep with contractor-built ½-yd. dump box, for hauling excavated material from a corrugated-metal tunnel shield installation. A sewer line will be thus threaded under the railway along one right-of-way line of the expressway



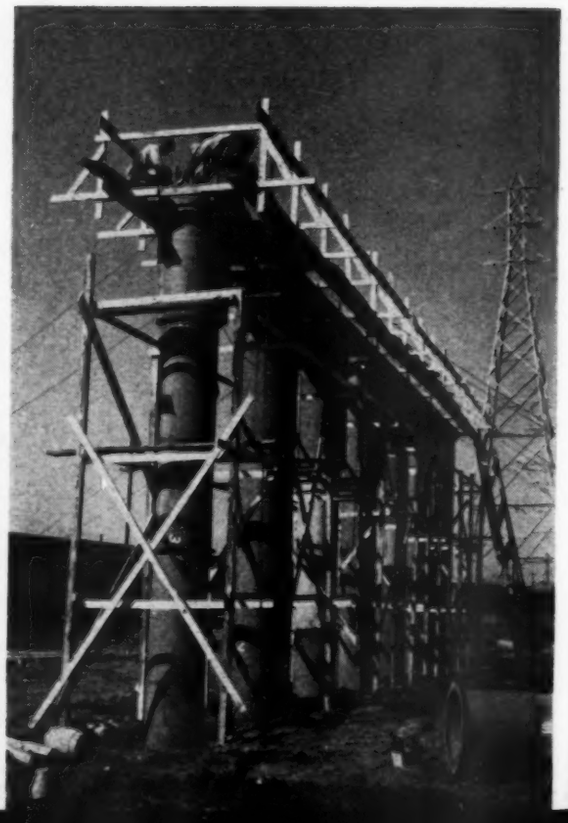
★ Overpass bents being constructed in groups of five, showing progressive stages of form setting and removal. Column forms are still in place on far bent

★ (See left): Specially designed steel circular column forms can be reused indefinitely, thanks to standardized column design

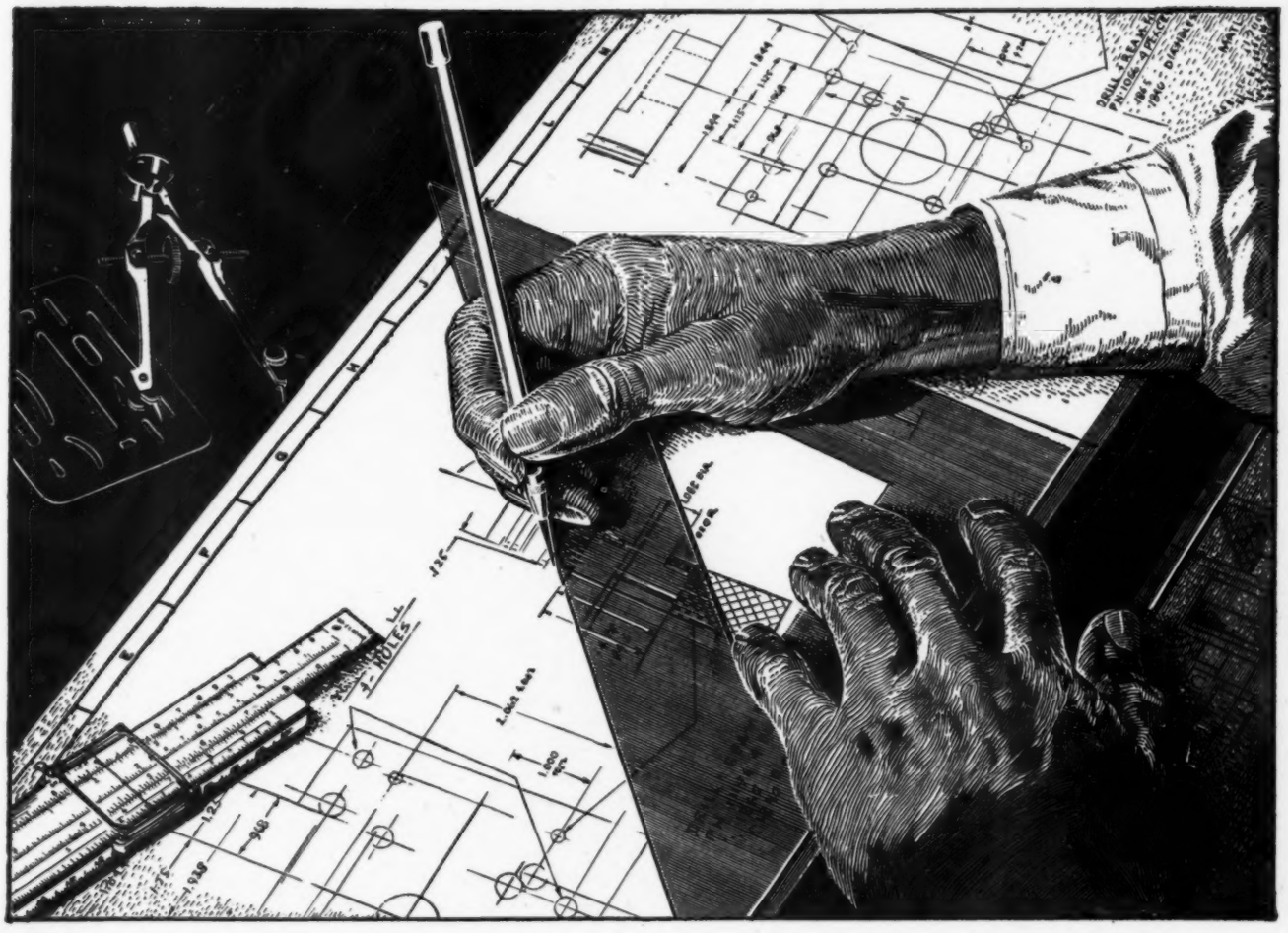
★ Rubbed, ready for cap. Hand rubbing resorted to in absence of satisfactory mechanical means of rubbing cylindrical surfaces



★ (Right) Elaborate, strong framing used by Brown & Root to insure accurate positioning of column forms. Yellow-painted steel angles, extending the length of the bent along each side at the top of column forms, are transit-checked for position by the contractor's engineer



★ Wet curing tarps in place. Curing of structural concrete is being watched with extreme care on the Houston expressways. Even below ground footing tops are shielded by canvas from the sun and air



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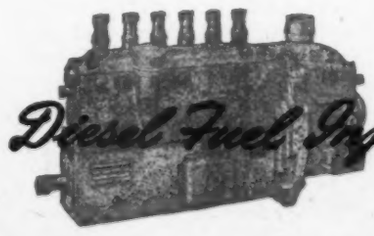
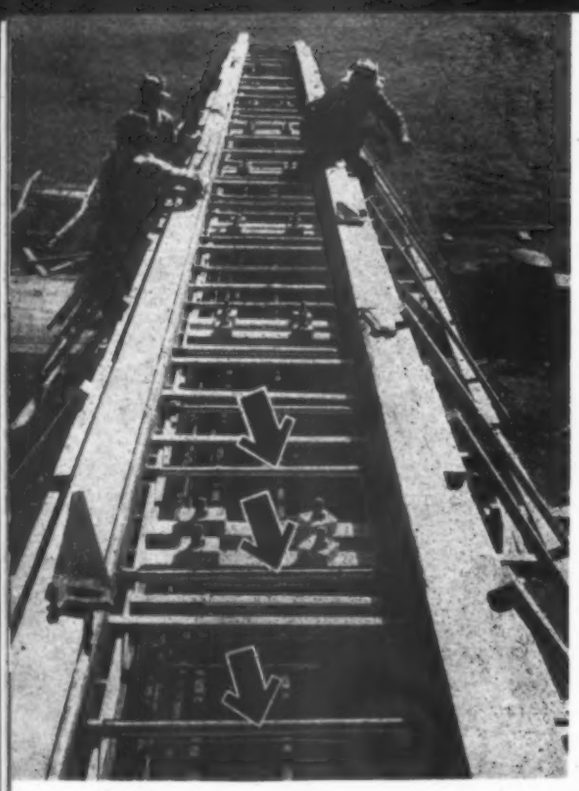
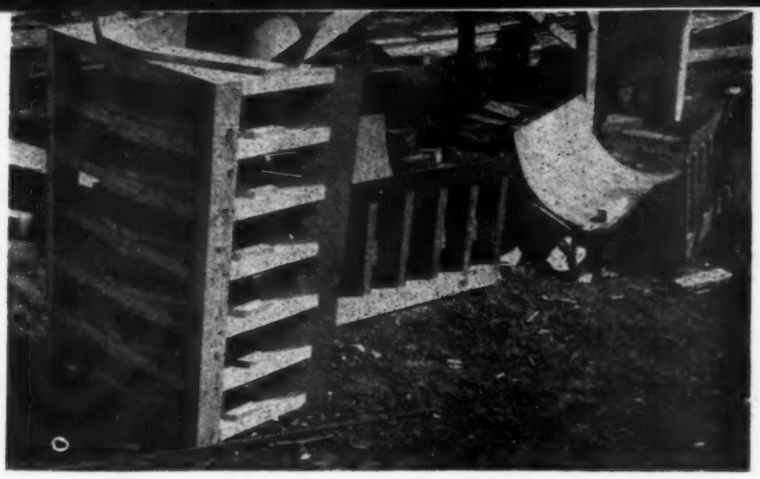


Diesel Fuel Injection

AMERICAN BOSCH

AUTOMOTIVE AND AVIATION ELECTRICAL PRODUCTS





★ Masonite-lined circular forms for rounded ends of column caps

★ Arrows show combination tie bolts and spreader bars, located above cap pour. Note anchor bolts in position

with F. M. Delk senior resident engineer for the state.

The Houston Urban Expressways with W. J. Van London as engineer-manager, are being planned and directed by the Texas highway department, D. C. Greer, state highway engineer.

See next month's "Roads and Streets" for one of the most complete detailed accounts of its kind ever published—of the soil testing and design procedure for earth and pavement structures for the Houston Urban Expressways.

•

Local Sharing of State Road Funds Increased

A significant trend toward increased distribution of state highway user taxes to local governmental units is revealed in a survey by the National Highway Users Conference.

Of the 36 states considering legislation to change the laws governing appropriations to cities, counties, towns and villages, changes have been enacted in Arkansas, Colorado, Indiana, Maryland, New Jersey, New Mexico, Oregon and West Virginia.

Arkansas has revised the distribution of the State Highway Fund, providing $750,000 to cities and towns when the fund reaches $13,500,000 and $2,000,000 to the counties when the fund reaches $2,500,000. The Colorado gas tax increase of two cents is to be apportioned 44% to counties and 6% to counties, cities and incorporated towns in proportion to the number of vehicles licensed, with the remainder going to the State Highway Fund.

A new Indiana law provides that gasoline tax proceeds in excess of $7,500,000 quarterly shall be distributed 64% to counties, 16% to cities and towns, and 20% to the State Highway Commission. Should the State Highway Commission's share fall below a guaranteed minimum of $30,000,000 each year for the next two years, the county and municipal share will be reduced. Maryland has increased the gas tax one cent, providing a new formula for distribution of entire gas tax. Thirty percent of the tax will go to the city of Baltimore, twenty percent to counties and municipalities other than Baltimore, and the remaining fifty percent to the State Road Commission for bond retirement. With the tax rise, this will increase the present allowance to Baltimore by 30.4%, the state's share by 56%, but will reduce the counties' allocation by 4.7%.

New Jersey has nearly doubled the amount of money to be appropriated to municipalities from the Motor Vehicle Fund, establishing a formula of allocation based on population and road mileage of such localities with a minimum of $200,000 in any county for all its municipalities. New Mexico doubled, from 15% to 30%, the share of registration fees going to county road funds and decreased the amount previously allocated to county, city and town school funds.

Oregon has increased the allocation of revenues from the Highway Fund to cities each year from 5% to 10%. $250,000 of this amount is to be spent by the Highway Commissioner directly on city streets which are not part of the Highway System. Another measure has increased the allocation of state funds to counties from 15.7% to 20%. West Virginia has enacted legislation allocation to the counties 80% of the one cent temporary gas tax for secondary roads.

•

New ASCE Annual Award

Establishment of a new annual award by the American Society of Civil Engineers in honor of the late Leon S. Moisseiff, New York consulting engineer, who at one time was bridge engineer and engineer of design for the New York City Department of Bridges, has been announced by the Society. The Society has accepted the offer of the Leon S. Moisseiff Memorial Committee establishing a sum of $4,000 to perpetuate the memory of Mr. Moisseiff, who acted as consultant and helped design many famous bridges, including the George Washington, Triborough, East River, Whitestone, Golden Gate and San Francisco-Oakland Bay structures.

The award, a bronze medal and an appropriate certificate signed by the President and Executive Secretary of the Society, will be made for an important paper published in the Transactions of the Society "dealing with the broad field of structural design, including applied mechanics, as well as the theoretical analysis, or constructive improvement, or engineering structures such as bridges and frames, of any structural material." The award will be open to non-members, as well as members of the American Society of Civil Engineers.

Special Editorial

★ How Can We Get Highway Engineers?

Wanted at Once—Highway Engineers, All Grades! Opportunity for satisfying life career with swift advancement to high responsibility and financial comfort for men of able engineering ability, executive talent, vision and initiative. Security, automatic raises, no politics. Retirement and other benefits. Big thrilling task revamping nation's highway life-lines offers challenge to best in you.

HAVE you seen such an ad? No, neither have we. Yet industry advertisements either offering or implying such conditions are being run everywhere, and they're snaring the best of our young engineers and not a few of our older highway engineers.

What Engineers Want

Some men prefer to aim for high money stakes, with higher risks. They become salesmen or entrepreneurs and belong in commerce and industry. Others of a professional bent would greatly prefer state-government careers in a highway department if they could be assured of a fair chance to make a decent, secure living, rise professionally and enjoy a feeling of being part of a fine team.

What is the solution? High organization morale, the result of real leadership and good working conditions (freedom from politics), can do wonders in spite of low pay. Witness the long waiting list of applicants to get on some of our best police forces. Kids dream of making the cop force because there's a lure in it, and because making the grade is a mark of ability. Some of our highway departments have high morale. Others haven't.

Other conditions, such as pension plans, sickness benefits, also are inducements. But the vitamin pill that most highway organizations need is higher pay. Latest to delve into this situation are the American Road Builders. ARBA's survey, states Engineer-Director Charles M. Upham, shows that 29 state highway departments cannot compete with higher salaries in other engineering fields. In these states salaries lag behind those paid not only by private industry but those in comparable government work; also behind ASCE recommended scales.

10,000 Needed

Between 6,000 and 10,000 more engineers are needed right now, and here we are midway through 1947 with programs marking time while drafting rooms are half empty. Illinois needs a thousand more engineers—triple its present strength! New York needs 977 men, further states the survey. California, 500. Think what these facts mean in terms of continued congestion and danger on overcrowded, worn-out roads.

What caused this shortage? Mostly a war exodus, looking at the immediate cause. Twenty thousand trained men left departments to enter armed forces or war industries. Only 59% have returned, speaking nationally—only 5 to 10% in some states, but 100% in others (Montana and Rhode Island).

Are state highway departments lining up current and future engineering graduates? Half of them have some kind of a working agreement. But less than a dozen have deals with colleges to train returned GI's who had war roadbuilding or airfield experience. A few try systematically to employ engineering students in summertime.

Pay, the Big Issue

Pay is the overshadowing issue. As stated repeatedly in these columns, there is a precedent for highway departments to dramatize their need and win better deals in legislative halls. Many legislatures are winding up their work at this time, and it's probably too late to get anywhere this year, if a real attempt hasn't already been made. But some state-wide raises or policies of pay liberalization have been won.

South Dakota Staff Gets Raise

A 10% blanket increase in pay for state highway department men was recently put through in South Dakota. The new scales went into effect two months earlier than originally scheduled, states a dispatch, so that the department could hold its personnel for the large construction program planned for the present season. Good work! Now for another one, say 30% or maybe 50%.

Why must so much of our highway department and city street department engineering work be done by public payrollers, anyway? We talk of the American system of private enterprise, and a vast majority of projects are let to private contractors to build? Why not also to survey and design under department guidance? Of course, sacred ground would be trampled on by inviting competitive bids for engineering services. And most highway departments aren't presently geared to such a policy or philosophy.

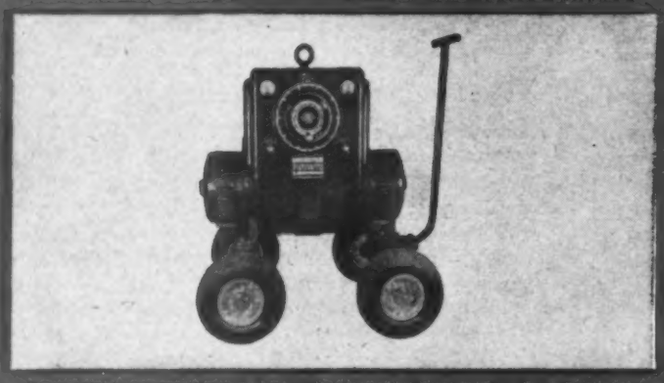
But this country is clamoring for getting on with the road program. The money to build is in the bank. Some kind of an earthquake is needed to get highway engineering back on its feet as a swell profession to train for, work in, stay in, get somewhere in.

GENERAL

INDUSTRIAL PNEUMATICS

. . . SPEED PRODUCTION

. . . INCREASE PLANT EFFICIENCY



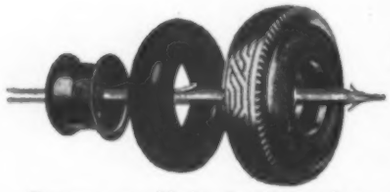
Hobart 300 ampere Electric Drive Welding Machine, mounted on General Industrial Pneumatic Tires—Manufactured by Hobart Brothers, Troy, Ohio.

MOVE MORE LOADS, FASTER, EASIER, SAFER

In buying or designing new material handling or other mobile equipment—Study these advantages of General Industrial Pneumatic Tires:

General Industrial Pneumatics . . .

Move loads faster and more economically . . . Protect floors and floor coverings . . . Roll easier over soft ground or rough surfaces . . . Protect fragile, easily damaged loads . . . Guard against spillage due to shocks or bumps . . . Roll silently—Eliminate noise . . . Eliminate shock and jar to operator . . . Designed for both high and low speed.



Factory assembled units: Heavy-duty Tire, Separate Tube, Heavy Duty Demountable Wheel and Rim; 8" to 22" o. d. for loads of 180-1900 lbs. per tire.

Wide base rim design, originated by General, has greater load capacity, guards against side-sway, permits low-bed mobile equipment design with low center of gravity that provides stability and straight-tracking in trailer trains. General has the ONLY demountable wheel. Separate heavy gauge inner tubes guarantee maximum air retention.

The GENERAL TIRE

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INDUSTRIAL PNEUMATIC TIRE • TUBE • WHEEL UNITS

(Continued from page 60)

100% in length (7 to 8 cm. in above diagram) to terminate on line PX'. Draw horizontal lines to terminate on XX' from O, N, and M.

Then, XM' is the percentage of material in the mixture that will be retained on the 60 mesh sieve, equals 34.4%; XN' is the percentage of material in mixture that will be retained on the 200 mesh sieve, equals 77.4%; N'O' will be the silt, equals 11.3%; and O'X' will be the clay, equals 11.3%.

Other trial mixtures may be made, but this mixture is satisfactory in that it comes within the limits given in B above. A larger proportion of Pit No. 2 material would reduce the clay content; a larger proportion of Pit No. 1 material would reduce the 60 mesh material.

D—ANSWER:

A mixture of 90% of material from Pit No. 1 and 10% of material from Pit No. 2 will meet the specified requirements as given under the heading B-PROBLEM.

•

Chicago Raises Speed Limit on Outer Drive

Lake Shore drive on Chicago's north side, one of the world's largest traffic streams, has been posted for 35mph. all through the war. Now limits have been raised to 40 and 45 mph. This change was made by the park board after extensive traffic studies along different portions of the drive.

Mail Inserted Card or Inquiry Blank (page 113) for Equipment Data

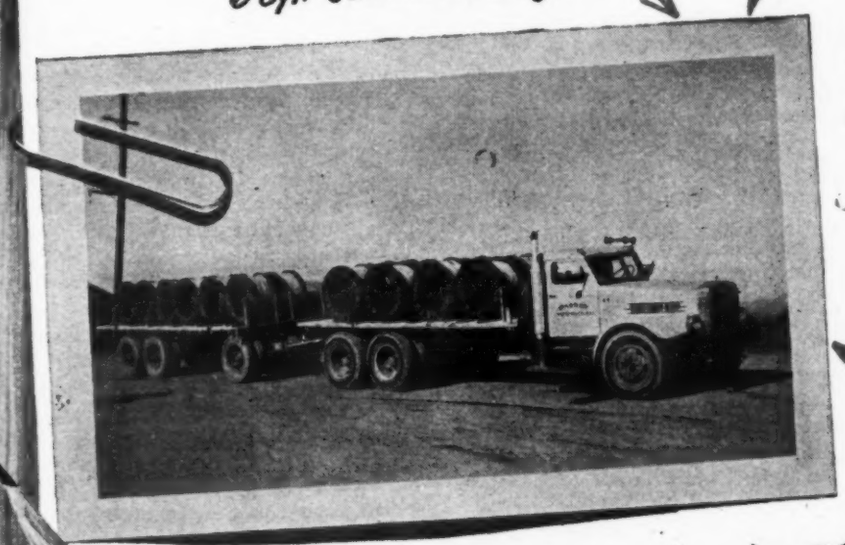
Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 95, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 113 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

LUBE MEMO

1/3rd million miles without major overhaul!

This Warren Transportation Co. truck ran 320,000 miles on RPM DELO OIL without major overhaul. Fluid Drive Sterling–6 cyl. Cummins Engine

Guy Warren writes all 20 of his heavy trucks give fine performance on RPM DELO Diesel Engine Lubricating Oil They travel 1,250,000 mi. yearly.



Av. gross load 14,000 lbs.

How does RPM DELO OIL Cut wear?
It's compounded to:
1. Stick to hot spots other oils leave bare
2. Stop bearing corrosion
3. Prevent engine deposits
4. Guard against sludge
5. Eliminate foaming

DIESEL ENGINE RPM DELO LUBRICATING OIL

NOTE: Thank Guy Warren, Hayward, Calif. for tip on RPM DELO OIL

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EDITORIAL

★ Surplus Disposal Still a Snarl

Equipment distributors and manufacturers aren't the only ones who have found it virtually impossible to make head or tail of the WAA surplus war equipment sales program.

A bulletin from Associated Equipment Distributors headquarters first tells of the confusion of reports coming from different sources within WAA on one particular situation; namely, that of equipment likely to be available from the Hawaiian Islands. One source says that the four million dollars' worth of construction machinery recently offered for sale there is about "all there is", while another states that inventories run to 13.6 millions on the island of Hawaii alone.

Both the Senate and the House sub-committees investigating surplus disposals, continues this bulletin, are encountering extreme difficulties in assembling pertinent data on WAA's surplus sales program. Because we are still short of some kinds of equipment in the U. S. and long on other kinds—and because this business in one way or another touches all of us —we take space here to quote AED's bulletin further as follows:

"Officials and minor employees appear before the Committees to testify one day and on the following date or shortly thereafter, they either resign, are fired or are transferred to the field offices and other departments.

"The systems and procedures of WAA disposals have changed so frequently that few are able to present in coherent detail any continuity of happenings which could shed some light on the maze of inconsistencies and irrelevancies in operation.

Responsible officials (or seemingly) suddenly become un-responsible or irresponsible when Congressional Committeemen try to tie down a particular case.

"As one Representative stated recently to your correspondent, 'It's a nightmare. No one seems to know why, when, where or how certain types of sales, negotiations, controls, etc., which bear the aroma of irregularity, happened to develop—but—they are quite sure of one thing—and that is that someone else was responsible or a predecessor agency did it—not them.' This Representative despairs of ever reaching any concrete conclusion other than the fact that the whole program has been mismanaged and confused to such an extent that future orderliness and businesslike approach to disposal can never be attained."

Meantime, as the fourth change in set-up since the war, WAA has established 80 Customer Service Centers to date with more to come. At these locations machinery seekers can presumably get current information on any sale to be held anywhere in the country. Also it is said that orders can be placed with the nearest center, with assurance that the order will be given equal recognition with orders placed at the sales site. Or so states WAA. More confusion is inevitable, it would seem.

Meantime the 1947 road building year goes lumbering on, with little slowing down of programs due to lack of this or that equipment. Maybe the real solution of this muddle lies in the equipment innovations here and on the way which will obsolete most of the wartime equipment, much of which is believed to be in bad shape and no bargain anyway.

★ Safety Emphasis on Design

There can be no doubt of the resultfulness of the president's traffic safety conference held in June a year ago. The climbing curve of postwar accident fatalities dropped measurably as a result presumably of the nation-wide publicity, renewed efforts on a thousand local fronts, and better application of techniques of enforcement and education found to work best.

The second annual conference, being held this June 18-20 in Washington, will examine action taken since the first national meeting and subsequent local conferences. Of course the program will be a balanced one, but we in the engineering end are glad to see that engineering questions will get a full play.

According to General Fleming, who will again head up the meeting as FWA administrator, reports will be asked on such questions as:

What are state highway administrative officials doing to co-ordinate road planning with the efforts of all other bodies engaged in traffic safety work?

How are design standards being revised for greater safety?

How intensively are the principles of controlled access for streets and highways being applied?

What noteworthy contributions to safety have highway maintenance people made?

Does your state highway department have a separate division with responsibility and authority for applying engineering measures toward greater accident reduction?

Are you fully up on accident charting and analysis? What of grade crossings? And so on.

ROADS AND STREETS will report quite fully on this end of the current conference, in the belief that many highway and municipal engineers have yet to give really all-out attention to safety in connection with planning, design, construction, signing and maintenance.

★ Whole Point in Expressways

We see by the papers that Denver is being held up on its much needed Valley Highway — long-contemplated expressway north and south through the city — while local businessmen, property owners and others with immediate selfish interests quarrel over the location.

The fact that the new route would miss the auto courts is one reason given against the proposed route.

This gets to the core of thinking in expressway design!

Expressways *must not* be skirted directly by auto courts and gas stations, hamburger joints and juke box handouts, or any other abutting enterprises as they enter a city's fringe. Such facilities can and should be located conveniently near, however, along parallel service roads. The whole meaning of the term "limited access," so vital to the solution of urban arterial traffic problems, is involved here.

Going farther, some expressways—in fact most—are being located on brand-new rights of way—utilizing lowest cost land—along the general axes of traffic in the light of serious traffic studies. These locations must not be compromised by local pressure to serve existing roadside facilities.

Equally bad is any compromise to please downtown interests who would like expressways to feed directly into the shopping district rather than skirt it.

Expressway locations often constitute a major incision into a city's "business as is," and is the price a city and its people must pay to get lasting traffic relief. Widening and elevating or depressing an existing arterial, and the addition of flanking service roads, will throw flanking businesses back onto new ground in any event. Oftener than not entirely new locations will permit use of cheaper right of way land, disturb existing business less, and do the most good for the least tax-money expenditure.

★ Who Should Drive?

During the late spring numerous regional or statewide traffic safety conferences are being held, and in June the leaders in traffic safety will gather in Washington for the President's conference on this subject.

As we muse over the tremendous importance of this organized attack and the complexity of the problem, a clipping comes to our desk stating that 318,000 motorists lost their driver licenses in 1946. The American Association of Motor Vehicle Administrators is credited with this statistic. Out of fifty million people who habitually or occasionally sit at the wheel, this is less than one per cent.

We haven't any figures conveniently at hand on the number of citizens who have failed to qualify as drivers to begin with. But we know and you know that in most states many unfit drivers still sail along the streets and highways. The 318,000 figure probably should be higher, but the big need is for screening out misfits in advance rather than catching them later: What's the good of "designing safety into the road" if the near-sighted, the slow-witted and other poorly qualified citizens can carouse along it because of lax driver license law or lax enforcement?

★ Automatic Batching Pays Off

California contractors sometimes have grumbled at the state division of highways' requirement of automatic batching plant equipment on road contracts (required as an aid to concrete uniformity). But in the main they have been quick to see the advantages of this equipment, and their gain has been demonstrated again lately by the big daily concrete yardages reported on certain projects. Griffiths, a crackerjack outfit, recently turned out 800 and up to 900 cu. yd. of concrete per 8-hour day with a 34-E dual on their US 99 job near Bakersfield, and near that yardage on another project near Colton. Automatic batching is credited with an important assist on this speed, not discounting for a minute the know-how and good management of the contractor's organization.

★ Give Radio a Try

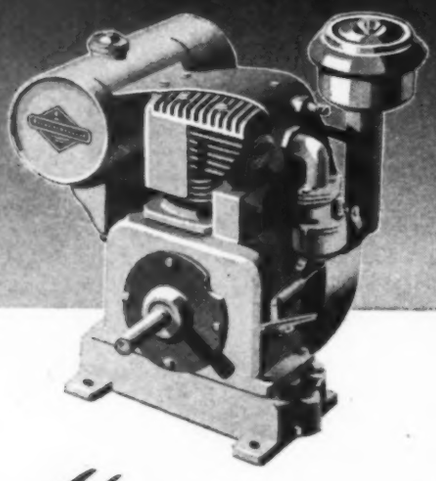
Now that county and state highway departments have been granted broader use of 2-way radio telephone, every highway organization of any size owes it to taxpayers to investigate this development to the fullest. Radio paid off big on snow plow work. It now is ready to help stage a minor revolution in the management and direction of highway maintenance work.

It is hardly necessary to go into the advantages of being able, at all times, to instantly talk to your cruising superintendents, foremen, repairmen and (in some cases) operators. Time is often the essence in directing road maintenance and repair work. Any system that will hasten, even by a few hours, the spotting and correcting of damaged shoulders, roadways and structures after heavy storms, for example, will be invaluable from a safety standpoint. Any such means of cutting down on idle equipment time and errands between office, shop and field is bound to be a money saver.

Radio, in short, should be considered a challenge. Road maintenance in many states and counties must be stepped up, directed with a more taut rein, accomplished with fewer men and machines, yes and with less money. This new tool, the magic voice in the dash panel, is worth a real try. From wide experimentation it will find its proper place in a public service that is becoming increasingly complicated as well as big and vital.

BRIGGS & STRATTON

ENGINES



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Million Planning Fund for Chicago's N.W. Highway

The Cook County board authorized the expenditure of $960,000, to be taken out of gas tax funds, for planning and developing the proposed northwest super-highway.

Money advanced would be repaid out of the 70 million dollar bond issue which the county has planned to spend on major highway improvements.

Bond Bill to Be Signed

This bond issue has been validated by a bill passed by the state legislature.

The proposed northwest highway would connect with the Congress St. improvement at about Halsted St. and would be a main artery to the northwest. The state, county, and city are to share the costs of the project.

•

Michigan Man Picked to Head Airport Group

Neil Brackstone, manager of the airport at Lansing, Mich., was elected president of the American Association of Airport Executives yesterday at its 18th annual convention in Chicago.

Other officers named are Douglas Longstaff of New Orleans, 1st vice president; Don Martin of Wilmington, Del., 2nd vice president; B. M. Doolin of San Francisco, 3d vice president; and Pat Moore of Peoria, executive director.

The association also adopted resolutions opposing any cut in civil aeronautics administration appropriations which would restrict maintenance of control towers at airports and asking that federal funds for airport development be given directly to cities rather than channeled through state governments.

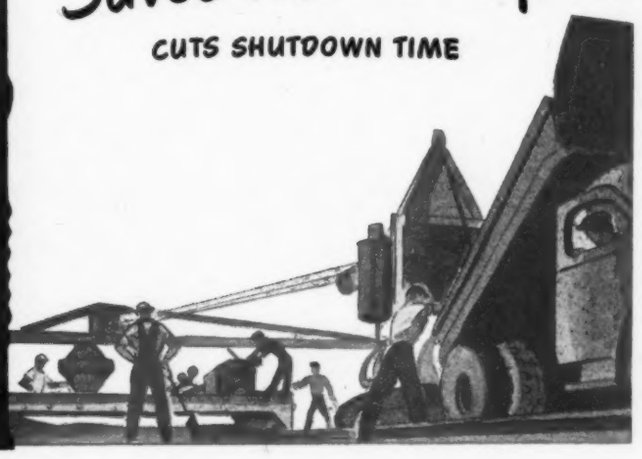
•

Steel Furnaces in U. S.

The number of steelmaking furnaces in the United States on Jan. 1, 1947, when annual capacity totaled 91,241,250 net tons, was 1170, ranging in size from small furnaces producing only a few tons at a time to units making 400 tons per heat, according to the American Iron and Steel Institute. That total includes 924 open hearth furnaces, 29 Bessemer converters and 217 electric furnaces. The number of blast furnaces at the start of this year, when capacity totaled 65,709,200 tons per year, was 233.

Removes Hard Carbon
Resists Sludging
Saves Wear & Repairs

CUTS SHUTDOWN TIME



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If you don't believe that D. H. D. is the best oil you have ever used, Lion Oil Company will give you your money back.

For normal service where D. H. D. is not required, use Naturalube Motor Oil (Not so heavily reinforced.)

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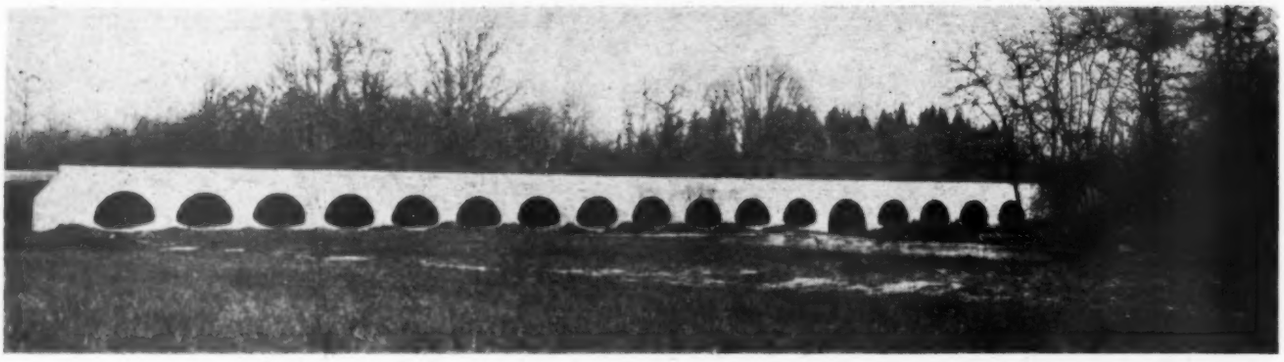
More Power—Lower Operating Costs

Naturalube D. H. D. is refined from a basically different crude oil. It has *natural* ability to remove hard carbon, a naturally tougher protective film and greater *natural* penetrative and adhesive properties. It is non-corrosive—safe! And in addition, it is specially reinforced to give greater resistance to the formation of sludge and lacquer.

To contractors and road builders, that means that D.H.D. saves wear... saves repairs... keeps engines cleaner and able to deliver maximum power. Operating costs are lower because fuel and oil consumption is lower.

Leading engine manufacturers accept D.H.D. as a superior lubricant. For complete information about Naturalube D. H. D. ask your Naturalube Distributor or write direct to Lion Oil Company, El Dorado, Ark.

LION OIL COMPANY EL DORADO, ARKANSAS



★ Completed culvert—seventeen openings, designed to take care of heavy flood flow with shallow headroom, thus obviating an open trestle and approach ramp grade

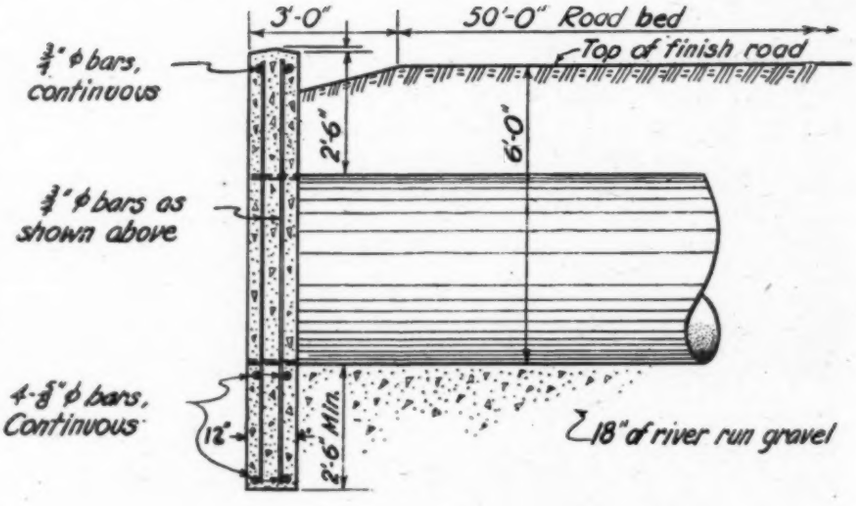
Seventeen Arches

in this Pipe Culvert

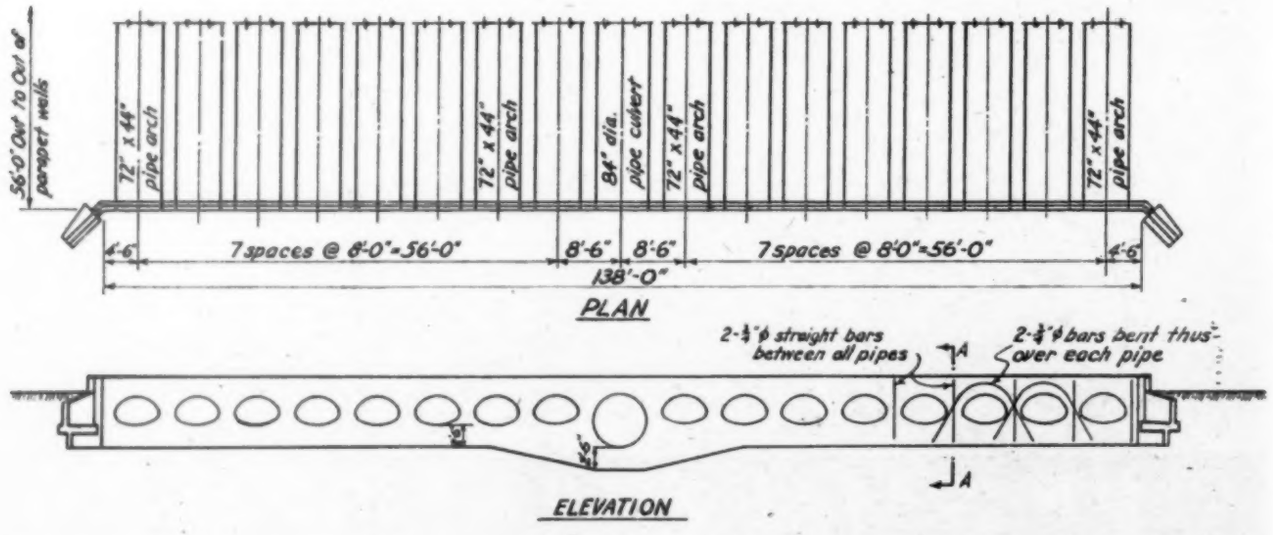
AN interesting culvert installed on the Sunset Highway west of Portland, Ore., last year is shown in the accompanying photos and drawings. The broad, shallow waterway and large peak flow made necessary a structure of some length, and it was found economical to provide a series of pipe openings rather than an open trestle.

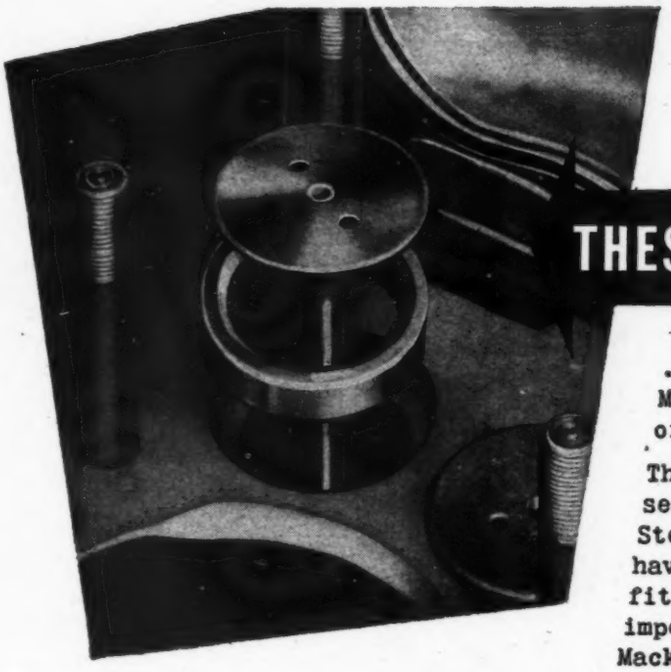
The design consists of seventeen corrugated-iron 72x44-in. pipe arches with a single 84-in. full-round corrugated pipe in the low-water stream channel. Length of pipe and width of the bridge is 56 ft. out to out of headwalls, or sufficient to accommo-

(*Continued on page* 86)



★ Details of the 17-pipe culvert





THESE INSERTS STAY PUT

... which is one more reason why Mack trucks click off extra thousands of trouble-free miles.

They're Mack Permafit exhaust valve seat inserts. They're faced with Stellite and copper plated. They have exceptional depth and are shrink-fitted into their pockets. Most important of all -- they're made of Mack's exclusive Niferrite alloy.

This secret alloy has the unique property of retaining a permanently firm fit within the pocket regardless of temperature variations between the insert and cylinder block. Thus, distorted and loose valve seat inserts are prevented.

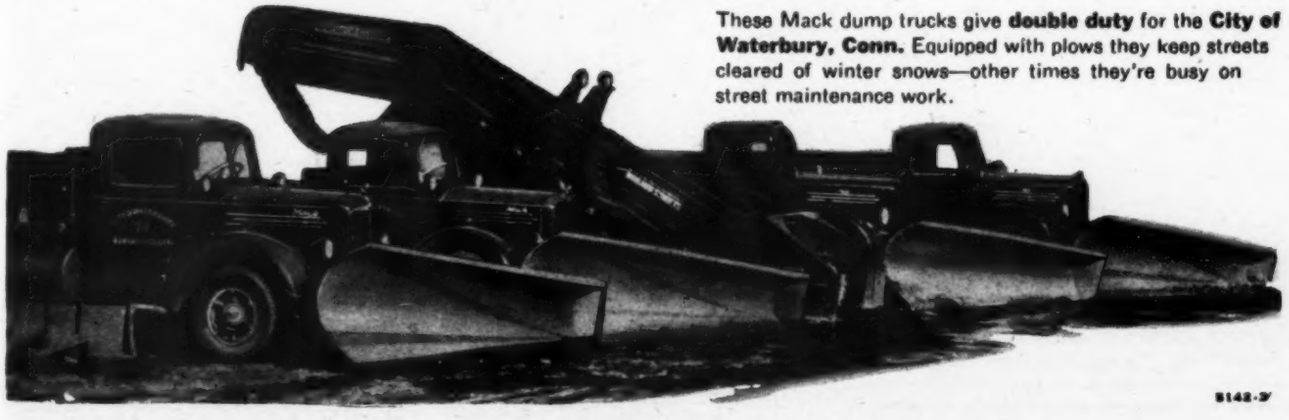
To Mack owners this means lower maintenance costs and more profitable mileage. Inserts have unequalled resistance to wear. Valve life is prolonged. There's less need for grinding. Engines maintain peak performance longer -- stay more economical longer.

This exclusive Mack alloy is a good example of the extra something that goes into every part of a Mack truck. You get more work out of Macks because we put more work into them.

Mack since 1900, America's hardest-working truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada, Ltd.

Trucks for every purpose



These Mack dump trucks give **double duty** for the **City of Waterbury, Conn.** Equipped with plows they keep streets cleared of winter snows—other times they're busy on street maintenance work.

B142-F

REPLACE DANGER
with SAFETY

DIETZ LANTERNS

Place DIETZ LANTERNS on guard for every emergency use. They faithfully guide the way, night after night, without diminishment of light.

DIETZ LANTERNS will not fail or falter as long as a drop of oil remains to burn. Many models will give light and safety for an entire weekend with plenty of kerosene left to spare.

Keep your DIETZ LANTERNS in good service—ready for use the moment needed.

Do not gamble with light and safety. DIETZ LANTERNS and DIETZ ROAD TORCHES give dependable light with safety—for over a century.

1840 R.E. DIETZ COMPANY 1947
NEW YORK
OUTPUT DISTRIBUTED THROUGH THE BUILDING TRADE EXCLUSIVELY

Highway Statistics, 1945

The Public Roads Administration has recently issued a new bulletin, Highway Statistics, 1945, in which are presented the series of statistical and analytical tables of general interest on the subjects of motor-fuel consumption, motor-vehicle registration, state highway-user taxes, financing of state highways, and highway mileage, for the calendar year, 1945. The brief text included in the bulletin highlights information of particular interest or significance in the tables. The bulletin can be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 35c a copy.

•

State Gas Tax Collections Over $1,000,000,000.—State motor-fuel tax collections and other receipts, such as inspection fees, dealers' license fees, fines and penalties, amounted to $1,064,681,000 in 1946, as compared with a total of $783,691,000 in 1945.

•

Chicago to Replace Trolleys With Buses

Bus lines eventually will replace most street cars on Chicago's streets under a $150,000,000 recently drafted plan by the Chicago Transit Authority. Highspeed cross-town rail lines will remain, but tracks will eventually be torn up from the streets elsewhere. this program anticipates.

•

Group Instruction for New Jersey Field Men

A program of group instruction in several branches of highway engineering was inaugurated recently in Newark, Trenton and Camden by the New Jersey state highway department. The lectures, conducted by the department staff, continued for three days and were designed to better acquaint employees of the Construction and Survey and Plans Divisions with the latest developments in many phases of highway engineering.

Subjects discussed included: Specifications, Review of Plans and Preparing Projects for Contracts; Geometric Highway Design Standards; Soils and Highway Foundations; Current Concrete Pavement Design and Related Research; Drainage and Drainage Structures; Highway Traffic Analysis, Planning and Economics; Work and Scope of Statewide Planning Survey.

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100% SELF-CONTAINED GAS HAMMER PAVING BREAKER

No Compressor or Hose

No Battery Box or Cable

Saves Money —Saves Time

BUSTING Concrete — DIGGING Clay, Shale and Frozen Ground — CUTTING Asphalt — TAMPING Backfill — and a host of other jobs.

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384 Lexington, Homer City, Pa.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS

Various widths, lengths, thicknesses—flat or curved—standard or special—punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk MANUFACTURING COMPANY

ESTABLISHED 1854

BUCYRUS, OHIO.

Airfield for small planes inexpensively paved with mixed-in-place

Sand-Asphalt Emulsion

Average bid of $1.35 and low bid slightly over $1.00 secured for 6 in. flexible pavement; travel plant used with interesting windrowing procedure

By M. T. Decker
Engineer, New York, N. Y.

THE Staten Island Airport, located in the Borough of Richmond in New York City, comprises an area of approximately 150 acres, of which about 70 acres are currently in use. The field is privately owned by E. J. McCormick and is used by two flying services who operate shops, schools, and charter service. Most of the traffic consists of Piper Cubs, Aeroncas, two seater army trainers, Stinsons, Beechcraft and an occasional twin engine C-47.

The turf runways and standing areas are in good shape, but the owner felt that during the latter part of 1946, runway improvements should be made so that all-weather contact operations could be carried out. At his direction, a master plan for the final development of the field was prepared and two sections of two runways selected for immediate improvement, with subsequent improvements to follow during the next twelve months. The areas to be paved were 2,000 ft. of each runway for a width of 80 to 60 ft., respectively. Both of these sections lie in areas previously graded and at the time of construction were in use by planes.

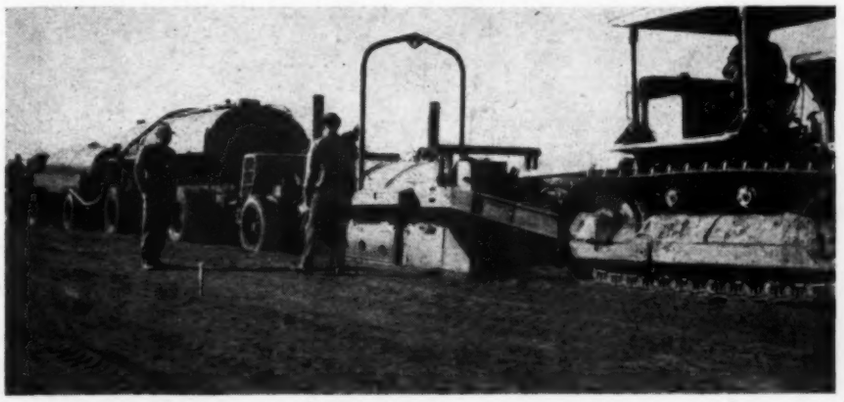
Borings Served 2 Purposes

The soil on the site is a sandy loam with a clay content running as high as 18% and with dense clay strata interspersed between the loam sections. Numerous borings were taken over the area in which it was believed good material could be found, and deposits of loam located, in which the clay content did not exceed 12%. Beyond the usual purpose of determining for the engineer the soil characteristics on the site, these borings provided information for the contractor showing that there was available sufficient suitable material for a mixed-in-place asphalt pavement.

Bids were taken on alternate types of construction; the first 4 in. of compacted limestone screenings placed with a 1½-in. mixed-in-place screenings and asphalt emulsion top; the second, mixed-in-place sand-asphalt emulsion pavement using material on the site. On this particular job, the latter proved to be much cheaper, costing slightly in excess of $1.00 per sq. yd. for 6 in. compacted depth, and hence was selected.

The James M. Morrison Company, holders of the contract, decided upon the use of travel plant or road mixer, of a type which has an extensive service record in the west and in foreign countries, but has been employed very little in the northeastern states (see photo).

Following the usual grading operations and preparation of the sub-

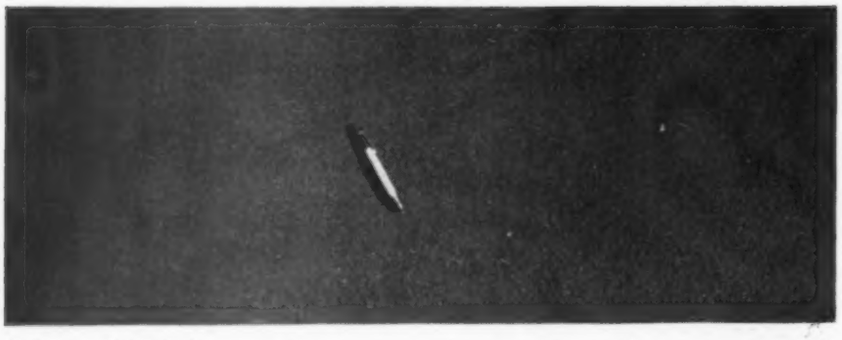


★ Surface of pavement at the time of final rolling prior to placing of seal coat

★ Complete paving unit. Tractor followed by road mixer and asphalt storage truck. The transport truck at the extreme left is refilling storage truck

★ Two windrows of paving material mixed and curing. The deeper color in the left hand windrow is caused by the road mixer being stopped while large stones were removed from the mixing chamber. At the right paving material is in place ready for mixing

★ Top 3" layer of pavement being compacted



★ Texture of finished pavement

grade, 7 in. of the selected material was uniformly spread over the entire area to be paved, and was next run through with scarifying teeth to disclose the presence of larger size stones which would not pass through the mixer and which were removed by hand. The paving unit consisted of a heavy Diesel tractor, followed by the road-mix machine, with the emulsion storage truck bringing up the rear. All three machines were coupled together, the tractor providing the tractive power. When the selected material proved too dry for satisfactory mixing of the emulsion, a water tank was coupled into the above unit by the side of the asphalt truck and pulled along in an offset position.

The complete unit traveled at a speed of about 17 ft. per min. and picked up, mixed, and windrowed a width of 8 ft. of paving material. The asphalt emulsion pumped from the tank into the spray bars on the travel plant was mixed at the rate of 3.75 to 3.85 gal. per sq. yd. of pavement. Inexperience in the use of the plant and a lack of knowledge of the importance of removing large stones from the mixed material at first caused unevenness in the mixed pavement. However, after these troubles were corrected the windrows showed a uniform black color and the machine provided a high performance factor throughout most of the work. The entire pavement comprising about 35,000 sq. yd. was completely mixed in 12 working days.

Spreading Procedure

Following the mixing of the material, the windrows were left for various lengths of time for curing. The top half was then pushed over into an adjoining windrow area and the bottom half spread and packed to a finished depth of approximately 3 in. After this operation, the mixed material which had been displaced was moved back on top of the rolled section, and in its turn spread and compacted. This was done windrow by windrow, extreme care being taken that unmixed material did not get into the pavement in the areas between windrow peaks. Rolling on the bottom section was done with a multi-wheel rubber-tired machine, followed by a 10-ton steel tired tandem. The top section was similarly treated except that a sheepsfoot roller was used as a first operation. The final treatment was a ¼-gal. application of emulsion as a seal coat into which limestone chips were rolled.

During the course of the contract, it was decided to use material suitable for future mixing on the balance of the shoulders of the runways for the total ultimate paved width. Also to place this material at each end of runways, so that future improvements can be made merely by mixing the material in place rather than removing the shoulder soil and bringing in new material. This procedure not only served the purpose of making use of the suitable material which would otherwise have been wasted, but also was chosen to allow future work to be done with a minimum disturbance to flying operations.

The writer is of the very definite opinion that, if suitable material can be found on the site, this type of work provides an excellent inexpensive pavement for the smaller classes of airports, where heavy concrete or bituminous macadam construction would prove very expensive or would, in fact, prohibit improvement of the field. The average of all bids received for this pavement was less than $1.35 per sq. yd., including fine grading, mixing, emulsion, and final seal coat.

Even where the site material is not suitable or would require heavy use of emulsion because of its gradation characteristics, the possibility of importing material for use alone or mixing should not be neglected. It is believed that even under these conditions the cost of this work compared with the laying and placing of other pavements will show a distinct saving in first cost.

The final tests on the pavement show a compaction percentage of 95 and an extrusion load for ½ in. of 35,000 lb. based on the modified Hubbard Field Test.

The engineer for the contractor on this project was Richard Worthington, Thomas J. Perkins as superintendent. The project engineer for the consultant was John Barnowich.

A Word to the Wise...

ORDER YOUR WALTER SNOW FIGHTERS *Now!*

WINTER may seem a long way off on the calendar—but if you want additional snow removal equipment next winter, better take action NOW!

Our shops are busy producing Walter Snow Fighters and Tractor Trucks. However, with demand running high, plus uncertainties in production, we'd like to schedule your needs now and make every effort to deliver on time.

We suggest that you get in touch with your nearest Walter distributor. He will be glad to give you full details on the many features of Walter Snow Fighters and help you select the correct model and equipment for your needs. If you wish, write us direct for detailed literature.

Advantages of

WALTER SNOW FIGHTERS

- **No slipping, stalling or wheel-spinning, because the exclusive 4-Point Positive Drive delivers power to each of four driving wheels according to its traction at any instant.**
- **Clear 28 foot widths in one run; clear at speeds up to 30 mph.; throw snow far to the side, making widening out easier; buck through deepest drifts.**
- **Models from 125 to 350 hp., available with correctly designed offset V-plows, one-way plows, speed plows, center scrapers, sand and chemical spreaders according to needs.**

WALTER MOTOR TRUCK CO. 1001-19 Irving Ave., Ridgewood 27, Queens, L. I., N. Y.

WALTER SNOW FIGHTERS

★ Scenes during installation of the culvert

★ Also installed on the Sunset Highway, Oregon, in 1946—twin 90-in. multiplate corrugated iron pipe culvert

(*Continued from page* 80)

date for the eventual four-lane graded roadway planned.

There are 24 in. of fill and pavement over the top of the pipe. Pipe was bedded carefully in 18 in. of good granular material and backfill hand tamped to specified density to a height 1 ft. over the pipe. The 138 ft. long concrete walls, serving to hold pipe accurately in position and prevent erosion, are of the usual 12-in. thickness. Each wall is reinforced with ⅝-in. round straight bars between pipes and ¾-in. round bars bent over each pipe, as well as top and bottom reinforcement as shown in the sketch. The headwall extends 2'6" below the pipe invert.

Two feet of clear space is provided between pipe walls, to permit proper backfilling and space openings out to the desired waterway width. Pipe was set by a crawler crane.

This culvert and also a twin 90-in. multiplate corrugated culvert on the same project, was fabricated by the Armco organization and installed by Lockyear & White of Seattle under general contract of the Sound Engineering & Construction Co. of Tacoma. The structures are part of an 18-mile relocation of the Sunset Highway, one of Oregon's largest postwar projects to date.

●

Illinois Seeks Condemnation Bill

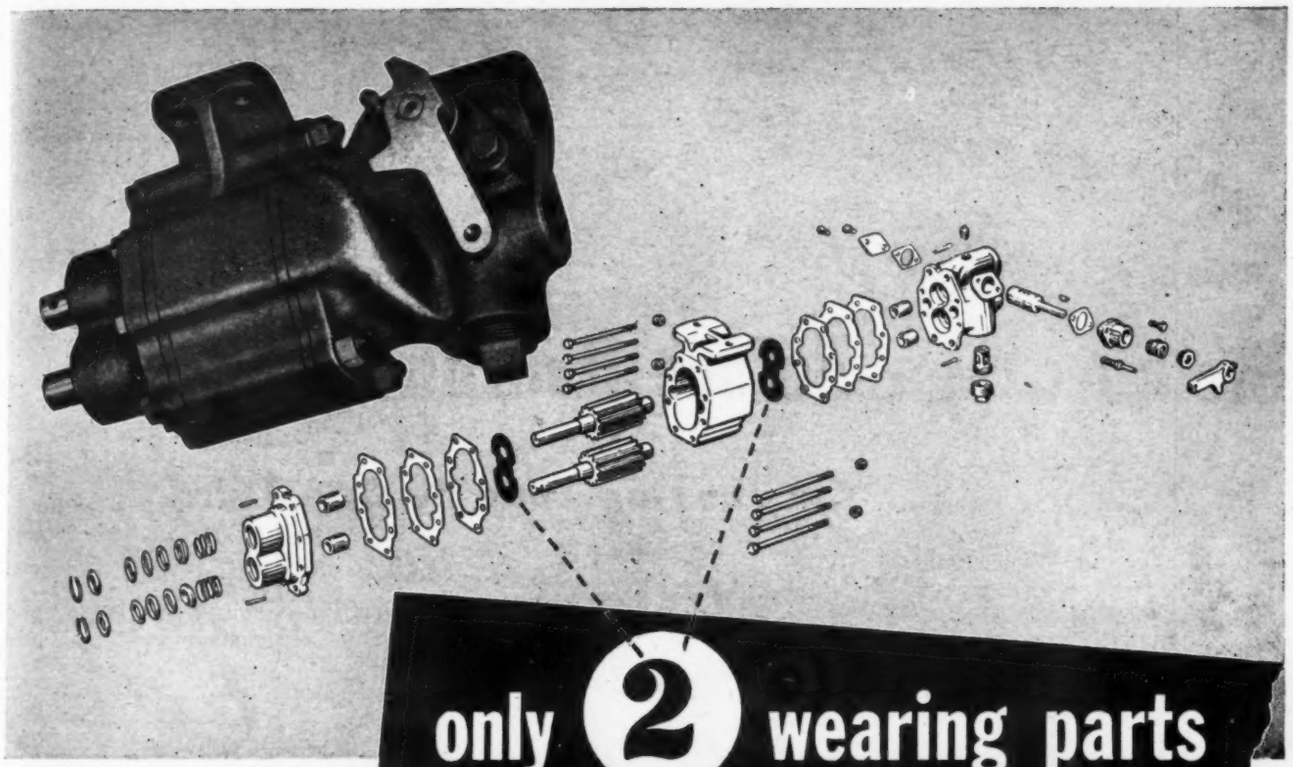
The Illinois state legislature's judiciary committee of the house recently recommended for passage a bill amending the state's eminent domain law to allow speedier condemnation of property for road and super-highway right-of-way. The bill, applicable only to highway construction, will permit the state to take possession immediately upon filing a declaration in court and depositing funds to pay the property owner. If the owner is dissatisfied with the sum, he may withdraw it without losing his right to a jury trial. Should a jury return a verdict for a higher amount, a judgment would be entered against the state for the difference.

●

Airport Program Now in Construction Stage

The first project approval under the Federal Airport Act was signed during May by T. P. Wright, Administrator of Civil Aeronautics, opening the construction phase of the 7-year airport building program. The approval will permit Twin Falls, Idaho, to start work immediately on a new Class III airport, to cost $647,000.

The Federal Airport Act of 1946 authorizes Federal expenditure of $500,000,000 for construction of new airports and modernization of existing fields. This sum, under the act, is to be matched by a nearly equal amount provided by the municipalities sponsoring the airports. So far, $45,000,000 of the $500,000,000 program has been appropriated by Congress. This sum has permitted allocation for 820 airport projects, of which the Twin Falls project is the first.



only 2 wearing parts in this pump ... and they are reversible and easily replaced

...another reason why you can rely on Heil Hydraulic Dump Units for greater profits

The heart of any hydraulic system is its pump. That is why Heil oil-gear pumps for Heil Dump Units are designed to provide the utmost safety and dependability. They are the product of years of engineering research and manufacturing experience. Nothing has been left to chance.

Look inside a Heil Pump and you see hardened and ground steel gears machined to very close tolerances. The use of these precision-made parts automatically means longer life. In addition, the gears run in an oil bath. Actually there are only two wearing parts in the pump; namely, the end plates between which the gears operate. These end plates are designed so that they can be reversed. They also are easily replaceable.

Each pump is tested before release, and must handle 10 gallons per minute. Yes, the care taken in the design and manufacture of these pumps is just one of the reasons why Heil Dump Units stay on the job faithfully, year in and year out — why they can raise loads as heavy as 24 tons to a 50° dumping angle in 10 or 15 seconds.

When you use Heil Dump Units, your trucks dump faster, make more trips, and require less maintenance. That is why Heil owners enjoy greater profits. Call on your nearest Heil distributor for additional reasons why Heil Dump Units are your best investment. Send for bulletins.

BH-125

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Steam Clean Before Overhauls

Cuts Lay-up Time By One-Third

Actual cost break-downs add to the interest of this helpful article.

By A. E. Moore
Equipment Maintenance Superintendent, Sebastian County, Arkansas.

AT our equipment maintenance headquarters near Fort Smith we have a large fireproof storage garage. The repair shop is located in this building. A paved wash rack extends back from the rear of the shop. A small stone one-story building flanking the wash rack houses one of the most important pieces of maintenance equipment which the county owns.

This is a tube boiler type coil system steam cleaner.

We use natural gas for fuel. Next to the steam cleaning unit, we have a 40-gal. soap tank mounted on 1½-in. pipe legs, raised to 7 ft. bottom level above the floor. This gives us gravity feed from the soap tank to the nozzle of the steam hose, where the steam and soap are adjusted as to flow by the operator.

With the tube boiler type steam cleaner, using gas for fuel, it requires less than one minute to get up sufficient steam to operate the pressure hose.

We have found this quick heating a big advantage. By the time the cleaner has the hose assembled, the steam pressure is up. There is no excuse for going back to some other job to wait for pressure.

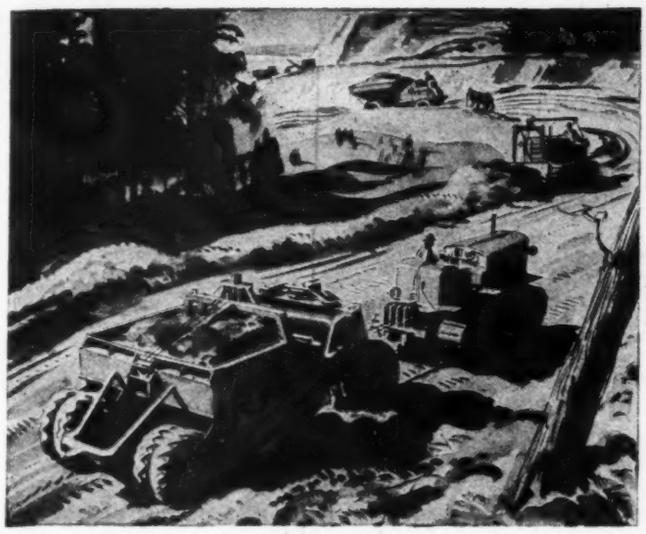
For our cleaning we use a commercial steam cleaning soap powder, in a mix of 5 lb. powder to 30 gal. water. This gives us a solution which will take care of four hours of continuous steam cleaning.

Types of Equipment Cleaned

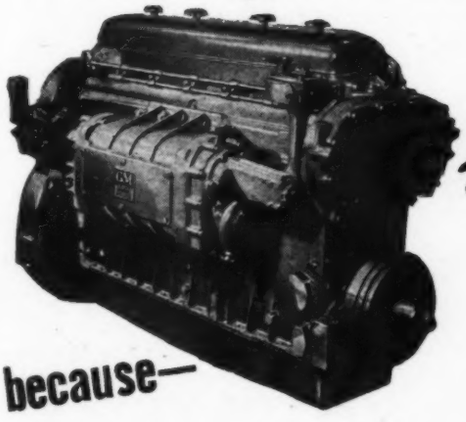
In our maintenance and repair shop we handle full repair and rebuilding for 20 pieces of major road equipment and for 35 trucks of different types. Before all major overhauls on these 55 pieces of equipment, we give complete steam cleaning. We also steam clean many units which come in for

★ A. E. Moore shows the tube boiler type coil system steam cleaner now used. 40 gal. soap tank at top center

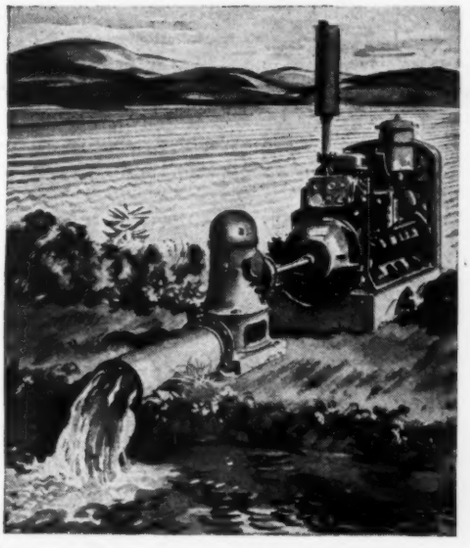
★ Joe Hardin, for 20 years road commissioner for Sebastian County. All maintenance and equipment repair is under the direct supervision of Mr. Hardin



Bring on the hard work



Here's the Engine for it!



because—

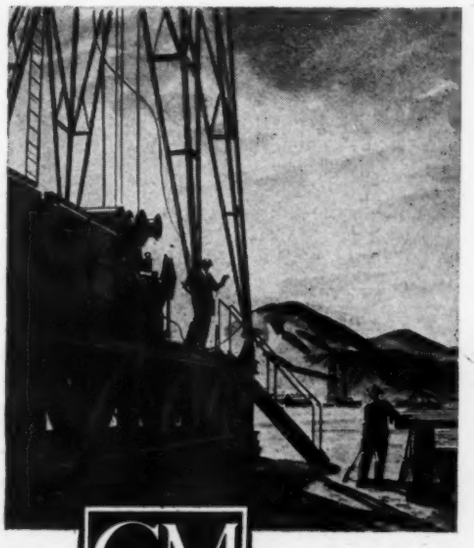
there's power at every downstroke

No matter where a General Motors Diesel engine goes to work, you can count on a smooth, steady flow of power. Because each piston downstroke is a power stroke, there are twice the number of power impulses for each turn of the shaft. A "six" is as smooth as a "twelve" in an ordinary engine.

Besides there's better acceleration under a load—and starting's quicker.

So it's easy to see why GM Diesels are "naturals" wherever a steady, sturdy, smooth source of power is required—why they are top-notch for lumbering, fishing, construction, well drilling and for every job where tough, compact, dependable power is needed.

So, no matter what your requirements might be, if you want sturdy, money-making, safe power, be sure to look into General Motors Diesel engines.



DETROIT DIESEL ENGINE DIVISION
DETROIT 28, MICH. • SINGLE ENGINES, Up to 200 H.P. MULTIPLE UNITS, Up to 600 H.P.
GENERAL MOTORS

GM
GENERAL MOTORS
DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

★ Steam cleaning a dozer wheel

★ Steam cleaning inside of 1½-yd. shovel before overhaul

★ Steam cleaning tow line. All trucks equipped with ¾-in. preformed wire rope line

minor repairs.

We also use the steam cleaner for cleaning all wire rope which is removed from equipment being repaired, or which comes to us for storage. Each truck is equipped with a ¾-in. wire rope tow line. These range in length from 25 to 150 ft. These ropes are cleaned with the steam cleaner each two weeks when the trucks are in for the regular two week's checkup.

Cleaning Tow Line

We use all preformed wire rope, most of it with wire center. We have found that the preformed, when given the proper cleaning and treated with a new dressing regularly, far outlasts the ordinary type. Many of our tow lines are made from lines retired from machine use. Regardless of how many broken surface wires a second use preformed rope has, none of them will flare to cause hand snags.

It requires about 30 min. to steam clean a 150-ft. section of ¾-in. tow line. Hot bath lubrication after steam cleaning requires not over 15 min. We use a special type lubricant recommended for ropes which are handled a great deal. We have found on all our wire rope lubrication work, it pays to use only such greases as are factory recommended for the particular job.

Steam cleaning soap and the after application of lubricant is an unimportant cost factor compared with the longer life and safer handling.

Labor Cost Items

We pay our cleaner, who is a mechanic's helper, $1 per hour. Cleaning the average 1½-ton dump truck requires 1½ hrs. We have kept a time record on cleaning 10 dump trucks and the total cleaning time ran 16½ hrs., or 1.65 hrs. per truck. For the 10 trucks checked for cleaning time it took 24 lb. of the commercial cleaning soap.

It requires four hours to steam clean a 1½-yd. shovel, and 5 lbs. of the cleaning powder.

We have found that no amount of steam cleaning will remove crater compound used for greasing dipper sticks, etc., nor will it romove asphalt.

For removing these two, we either soak the part in kerosene, or if not a removable part, apply a cold pack commercial cleaner. Depending on the volume, it requires from 1 to 12 hrs. for the kerosene or cold pack cleaner to cut through. We then give the part or frame or body section a second steam cleaning.

★ Here Mr. Moore explains why the county uses all preformed wire rope. "We have found," he says, "that preformed when given the proper cleaning and treatment far outlasts the ordinary type"

Comparative Major Overhaul Costs, With and Without Steam Cleaning

It is hard to get a fair average major overhaul cost because no two jobs are alike; however, on the last 10 truck overhauls we did complete pre-steam cleaning. They were 3 K-7, 2½-ton International dump trucks; 3 1½-ton Fords, 2 dump and one straight body; and 2 Federal 4-ton dump trucks. On all 10 jobs the work was handled by one master mechanic and one helper. For the ten trucks the time and cost breakdown is as follows:

Labor time ave. per truck..47¼ hrs.
Labor cost ave. per truck.....$61.35
Parts cost ave. per truck.....129.40

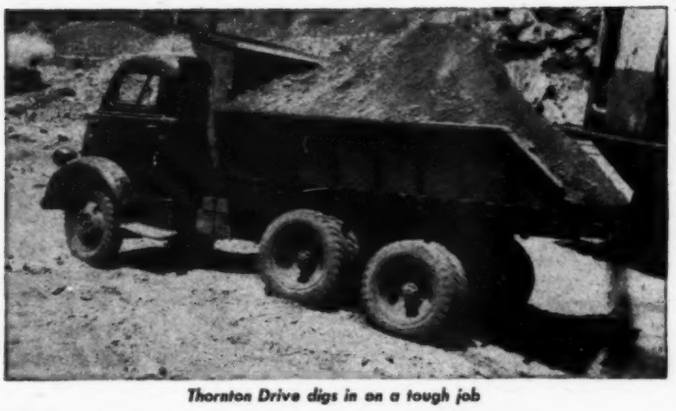
Using the average labor and parts replacement cost on 10 similar trucks which had not been given pre-steam cleaning before major overhaul, the breakdown is as follows:

Labor time ave. per truck....64 hours
Labor cost ave. per truck.... $85.90
Parts cost ave. per truck.... 132.70

As the complete steam cleaning time did not run in any case over 2 hrs. and averaged around 1½ hrs., this shows a time savings on unit

WITH THESE DETROIT AUTOMOTIVE PRODUCTS YOU GET

GREATER PROFITS
from Truck Operation

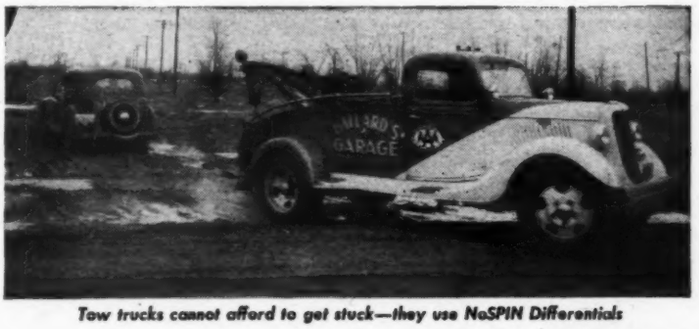


Thornton Drive digs in on a tough job

DETROIT AUTOMOTIVE

THORNTON DRIVE

Increased payloads mean increased profits! Put your medium (1½-2 ton) truck in the heavy class by installing a Thornton Drive. Four independently-driven rear wheels for greater traction, G.V.W. up to 32,000 lbs., performance and earning power increased 100%—yet you still have the economy of a medium truck.



Tow trucks cannot afford to get stuck—they use NoSPIN Differentials

DETROIT AUTOMOTIVE

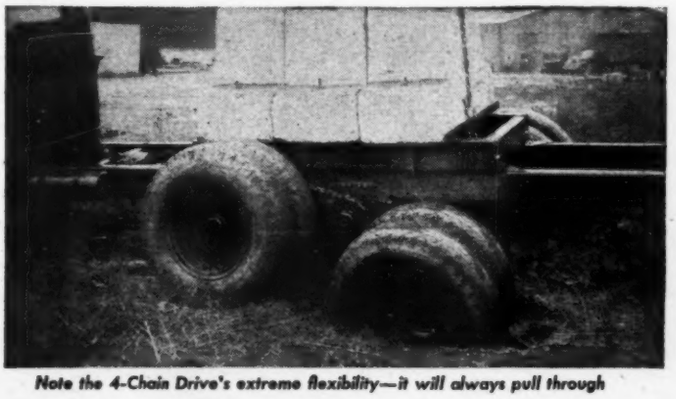
NoSPIN Differential

Time is money! A stuck truck costs *both* time and money. With a NoSPIN Differential installed in your truck, your vehicle can't get stuck in mud, snow or ice as long as one driving wheel has some footing. Thousands of truck owners have realized greater profits from time saved by using NoSPIN Differentials.

DETROIT AUTOMOTIVE

4-CHAIN DRIVE

For heavy hauling and tough going, you can't beat the Detroit Automotive 4-Chain Drive. Installed on your heavier chassis, this rugged unit gives you a powerful six-wheeler with a G.V.W. up to 44,000 lbs. Maximum traction from positive 4-Chain drive together with big payloads mean *profitable performance* under any conditions.



Note the 4-Chain Drive's extreme flexibility—it will always pull through

DETROIT AUTOMOTIVE PRODUCTS CORPORATION

(formerly Thornton Tandem Co.)

8701 Grinnell Avenue • Detroit 13, Michigan

Distributors: In U.S.A.—Truckstell Distributors Export—Herthornway Export Corp.

lay-up of 15½ hrs.—a lay-up gain in time of nearly two working days.

Motor Grader Costs

On the last motor patrol which was given a complete steam cleaning before the major overhaul, it took 5 hours for the cleaning, including cleaning the wire rope lines used as tows.

The total patrol overhaul cost came to $609.97, and included replacements with either new or reconditioned parts as follows: 6 sleeves, pistons, pins, and rings; 7 main bearings and 6 rod bearings; 12 valves and 12 guides. New side shift housing and pinion shaft, including bushings and grease seals. Spindle bolts, bushings, all blocks, pins, center pin and bushing for front axle. 8 new bearings, new fly wheel grease seals and sleeves for transmission.

Of this $609.97 overhaul total, $401.82 went for parts and replacements, and $208.15 was labor, using 2 mechanics and 1 helper. Time here was less than 6 days, including 5 hrs. of helper's time steam cleaning the patrol.

While there was less work needed on this last patrol job, in comparison with other patrol overhauls where steam cleaning was not used, labor cost and time ran about double on the non-steam cleaned jobs.

There is no question but that a good part of the major overhaul time cost savings here is due to the pre-steam cleaning.

Cleaning of Parts Before Repairing, Saving Also

In connection with the steam cleaning, we use a hot solution treatment for all parts such as motors, transmissions, rear end parts, etc., before they are to be worked on.

We use a commercial compound here which we mix according to manufacturer's instructions, one part cleaner and four parts water. This is placed in a metal tank and brought to a boiling tank through the use of an inside coil set around the bottom of the tank.

With the hot tank cleaning method, it requires from 45 min. to one hour to do the cleaning. The parts are removed from the tank and cleaned with the steam cleaning hose, no soap added. This after cleaning requires but a few minutes and leaves the parts clean for the mechanics.

It has been our experience that cleaning all parts before repair work is done not only lessens the repair time but accounts for a better repair job.

Steam Cleaning of Units, Hot Solution Cleaning of Parts

We operate our shop under the semi-replacement assembly plan. We keep on hand rebuilt motors, transmissions, rear end assemblies, and many complete smaller units ready to install.

This rebuilding work is done when lay-up repair jobs are not crowding.

Following this complete unit replacement plan has accounted for a good reduction in lay-up time on all of our equipment, which is the important factor today.

We keep a cost record on all replacement parts repaired. This record shows the time required and the cost of new parts going into the assembly. In this way we know what has been done to each motor, transmission or what, which we have waiting for an installation in the reserve room.

Taking a motor at random (95 hp. Ford motor from a 1½-ton truck; used also in Ford pickup truck), the labor charge on rebuilding came to $24.50. New parts used $64.37. Salvaged parts used in the rebuilding, $2.15. A total cost on this reconditioned motor $91.02.

While we do not go through our record and increase prices as parts prices increase, we do try to have our cost records show the actual cost of the parts at the time the reconditioning was done. For example, we are paying 50% more for some parts than we did a few years back.

If a repair job takes a new transmission, we show the actual new cost on the record. If a replacement can be used, using a rebuilt transmission which was rebuilt say three years ago (a rare case, however), we try to raise the replacement cost charge by enough to cover the increase in parts used.

From the experience of assembling units ready to be replaced, I am convinced that hot tank cleaning and steam cleaning of all parts is a big time saver and boost to our assembly replacement program. We have no figures as to the time saved because we are just now completing the record system on rebuilt unit assembly.

Simplified Shop Record for Cleaning, Oil Changes, Greasing, Tune-Ups

Each truck is given a general check-over and a complete grease job each two weeks. The same schedule applies to large equipment whenever it is at the headquarters. Often the units are also given a steam cleaning. If the frame and body need cleaning before the check-up, we do the cleaning.

For a quick shop reference record on this work we have worked out a symbol marking system. A circle indicates an oil change. An "X" inside the circle, or without the circle, indicates a complete grease job. A dot between the lower crosses of the "X" tells us that the oil cleaner filter has been replaced. A square is made for steam cleaning. If the motor is tuned and a general check-up of frame given

Road Machinery Owned by Sebastian Co.

1 Austin-Western 99-M Motor Patrol
3 Caterpillar No. 12 Motor Patrols
1 Adams Model 511-12 Motor Patrol
1 Caterpillar No. 30 Tractor
1 Caterpillar RD-7 Tractor
1 Caterpillar Tractor D-7
1 Caterpillar D-4 Traxcavator
1 John Deer Model H. Tractor
1 La Plant-Choate 5-yard Fresno
1 La Plant-Choate 12 foot Bull Dozer
2 Caterpillar Pull Graders
1 Byers 1½-yard shovel
1 International Bull Dozer
1 Austin-Western 10-ton Roller
1 Huber 5-ton Roller
3 Air Compressors; Sullivan, Ingersol-Rand, Worthington
1 Grace 7-Foot Road Sweeper
1 Rex Paver 21-E
3 Concrete Mixers; Koehring, Foot, Grace
35 Ford, Dodge, Chevrolet, International, and Federal Trucks—(From 1½ yard to 3 yard dumps except 9 which are flats and pickups)

★ (Left): A 1½-yd. shovel brought in for the regular two-weeks' check-up. (Right): Superintendent Moore checks wire rope lines on shovel at the two-weeks' check-up

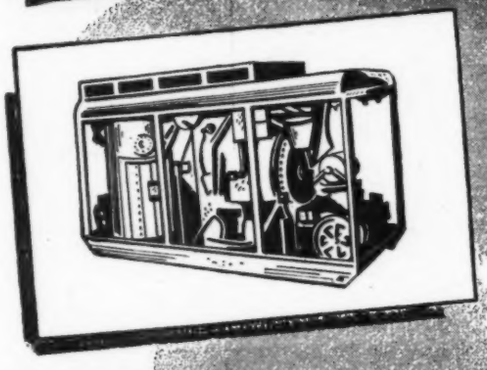
LOW COST WATER PURIFICATION

for clear clean drinking water

Here's the equipment you need for quick, simple, Water Purification, Chlorination, or Distillation. Made by well-known manufacturers to high industrial standards, this equipment is now available to you in compact mobile and portable units—simple to install, easy to adjust, and priced far below cost. If you want to buy one of these units—or all three types for a complete conditioning plant—contact Chief, Sales Section 67, at the Regional Office holding the inventory. You'll get complete description, specifications, types of equipment available, prices and other pertinent data. Write, phone, or visit your nearest Customer Service Center or Regional Office.

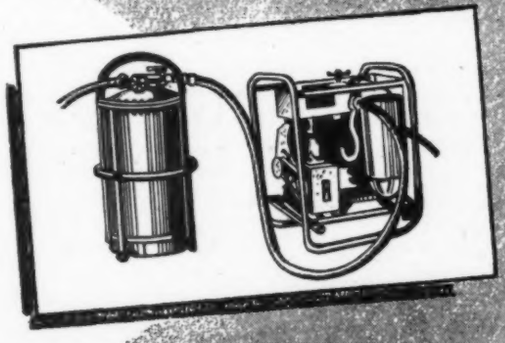
All purchases are subject to the War Assets Administration's standard conditions of sale, and all items are subject to prior sale.

Priority claimants have already had an opportunity to fulfill their requirements. Arrangement for inspection of these units may be made at any Regional Office where inventory is located.



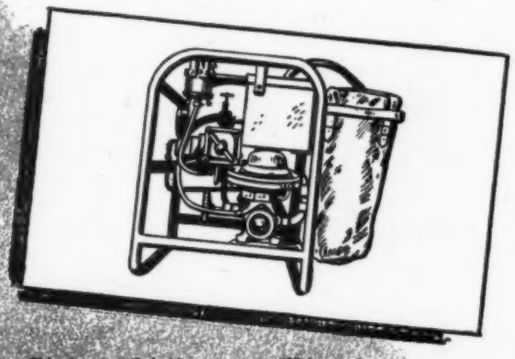
Water Distillation Unit—This equipment is adaptable to many uses by industry and small field organizations. Some units are trailer mounted fully equipped with tires, ready to move to the working locale; other units are portable, neat, compact and mounted on skid-type frames. Unit consists of a gasoline engine, steam compressor, and other parts and necessary piping all assembled and mounted on a structural steel base. Most of the units need no direct fired fuel burning equipment. A few units have oil burners. Available in "unused" and "used" condition at WAA Regional Offices listed below.

Location: Trailer mounted type: Atlanta, Los Angeles, Nashville, New Orleans, New York, Richmond, Salt Lake City and San Francisco. Location: Skid-mounted type: New York, Richmond, Salt Lake City, San Antonio, San Francisco and St. Louis.



Portable Water Purification Unit (Mobile)—Converts impure water into clear, clean drinking water. The equipment can be cleaned easily with little loss of operating time. Consists mainly of a pumping unit and a filter unit. The water is cleaned by harmless chemicals. Forcing water reversely through the filter, washes the unit thoroughly. Available in "unused" and "used" condition at WAA Regional Offices indicated below.

Location: Birmingham, Charlotte, Houston, Jacksonville, Kansas City, Little Rock, Los Angeles, Nashville, New Orleans, New York, Richmond, St. Louis, Salt Lake City, San Antonio, San Francisco, Seattle and Spokane.



Hypo-Chlorination Unit (Automatic)—This equipment efficiently chlorinates from 2 to 100 gallons of water per minute. The chlorine feed can be proportioned over a range of 10 to 1 for any one setting of the adjusting valve. Unit consists of hydraulic-operated hypochlorinator, water meter, pressure regulating valve and manual range adjusting valve. Installation is simple—just connect the unit into the water line. Available in "unused" and "used" condition at WAA Regional Offices indicated below.

Location: Houston, Nashville, New Orleans, New York, Richmond, Salt Lake City, San Francisco and Spokane.

OFFICE OF GENERAL DISPOSAL

WAR ASSETS ADMINISTRATION

GOVERNMENT WAA SURPLUS

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago
Cincinnati • Cleveland • Denver • Detroit • Grand Prairie, Tex. • Helena • Houston
Jacksonville • Kansas City, Mo. • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans
New York • Omaha • Philadelphia • Portland, Ore. • Richmond • St. Louis • Salt Lake City
San Antonio • San Francisco • Seattle • Spokane • Tulsa 1123

★ Book used for simplified shop record on steam cleaning, grease, oil change, tune-up, etc.

The Symbols Used For

Regular Two-Week Check-Up

○	For oil change
×	Grease job
⊗	Grease job and oil change
•	When oil cleaner filter is changed
⊗	Oil filter change, grease job and oil change
▭	Body and frame given complete steam cleaning
✓	General tune-up
▭✓	Steam cleaning and tune-up

after steam cleaning, we use a check mark in the square.

By using a standard notebook with ruled pages, and using the left-hand open page for a numbered list of all units of equipment which we service, then cutting back the remaining fold over pages sufficiently to allow the unit numbers to show, we have a record book that will last us more than a year.

Pages which have been cut on the margin are ruled up and down for the two weeks' checkup symbols. The date at the top tells us what units were given the checkup and what ones missed. The symbols tell us exactly what work was done to each unit for that period.

If a tractor or other piece of equipment comes in for a major overhaul, a glance at the record will tell when it has been steam cleaned and what other work was done.

In our maintenance and repair program, which in recent years has accounted for a great deal of major overhaul work, we have found that pre-steam cleaning pays us big dividends all around. We are having much shorter lay-ups on major overhauls. We are doing a better job of rebuilding parts for unit assembly. This is true mainly because we are working on equipment which is CLEAN.

•

Dean Agg Is Dead

Iowa State College, Ames, Iowa, has lost a leader, an energetic, lovable, direct action person in the death of Thomas Radford Agg, Dean Emeritus of the Division of Engineering. At the age of 69 your friend, and certainly mine, was stricken down by coronary thrombosis. Many men in the highway engineering and construction field owe their existence, as it were, to the sympathetic attitude Dean Agg held toward young men who could qualify for higher education and who had to work their way through college. I definitely recall the many concessions made to me and to others in my economic status by this dynamic, exacting yet friendly and in fact, enjoyable, inspiring character as we struggled toward graduation. Dean Agg always said what he meant, meant what he said, corrected our mistakes, went out of his way to aid us in our problems, advised, and criticized where it was due, and in my own case, fathered me during those egotistical years of my youth.

On July 1, last year, Dean Agg retired as head of the Division of Engineering and Director of the Engineering Experiment Station at Iowa State College. He had served as dean for the past 14 years. He was born at Fairfield, Iowa, on May 17, 1878 and received his bachelors degree in electrical engineering at Iowa State College in 1905. In 1914, he received his professional degree in civil engineering at Iowa State College.

He served as an instructor in the engineering college at the University of Illinois and then as road engineer for the Illinois Highway Commission from 1908 to 1913. In 1923, he became an assistant professor of civil engineering at Iowa State College. In the next two years, he was associate and then professor of civil engineering. In 1931, Dean Agg was named assistant dean of the division and in 1932, he became dean and director of the Experiment Station.

He was a member of the American Society of Civil Engineers, the sectional committee for the American Society for Testing Materials, the American Society for the Promotion of Engineering Education. In 1937, he was named president of the Iowa Engineering Society. His book "Roads and Pavements" has been a standard text book in American and foreign colleges for 25 years. He also wrote one on "Highway Finance" and was co-author of one with Dean Marston on valuation and of another with Prof. Foster.

Dean Agg was also a member of the Highway Research Board; Newcomen Society; Tau Beta Pi, engineering honorary; Sigma Xi, science honorary; Phi Kappa Phi, general honorary, and Cardinal Key, Iowa State College's highest honorary for men.

—V. J. (Vic) Brown, C.E.,
Director, Caminos y Calles.

•

All Time Record for Gas Consumption

The amount of fuel consumed by motor vehicles operated on highways in the United States during 1946 established an all-time record, according to figures compiled by the Public Roads Administration from gasoline tax collection reports submitted by state agencies.

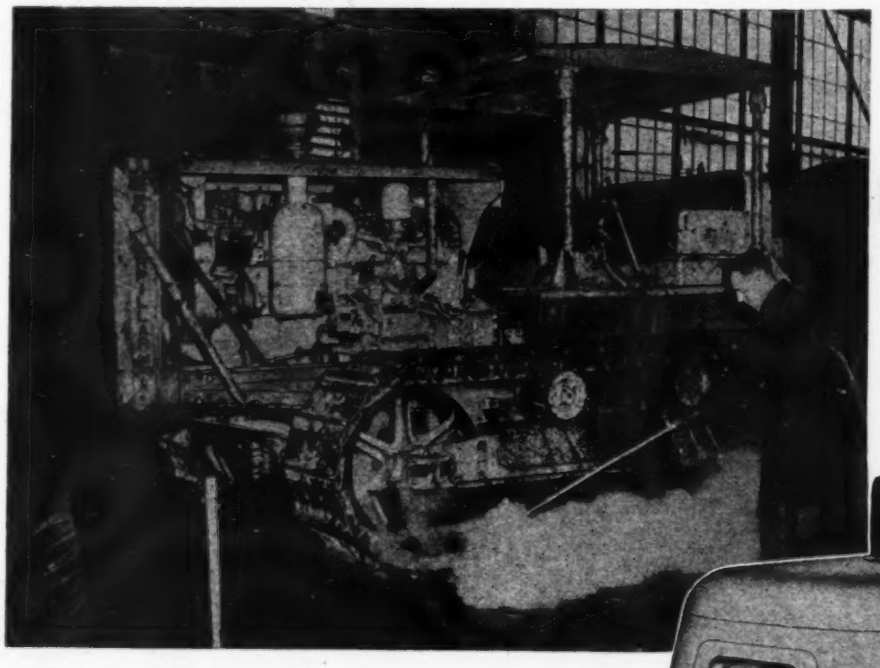
The reports showed that approximately 25,868,000,000 gal. of motor fuel were consumed in 1946, as compared with a total of about 19,340,000,000 gal. in 1945, an increase of 6,528,000,000 gal., or approximately 33%.

California led all states in the volume of motor fuel consumption, with a total of 2,436,430,000 gal. in 1946, an increase of 626,193,000 gal. or 34.6% over the 1945 figure. New York was second with a total of 1,792,865,000 gal. consumed in 1946, which was 486,945,000 gal., or 37.3% more than the total motor fuel consumption in the preceding year. Pennsylvania was third with a total of 1,653,352,000 gal., an increase of 32.7%, and Texas fourth, with a total of 1,546,335,000 gal., an increase of 30.4% above motor fuel consumption in 1945.

CLEAN

- Dirt and Grease From Heavy Machinery
- Motors Before Overhauling
- Equipment For Repairing
- Tools . . . Walls . . . Floors . . . Runways

8 to 10 Times Faster



with HYPRESSURE Jenny STEAM CLEANER

Compact . . portable . . . easy to operate . . . Hypressure Jenny can be used on the job or in the shop. In less than a minute from a cold start, Hypressure Jenny's blast of steam, hot water and cleaning compound, loosens and flushes away almost instantly, mud, muck, dirt, and grease from construction equipment.

When used to clean machinery before repairs, Hypressure Jenny saves up to 40% of your mechanics' time which otherwise would be lost wiping oil and grease from tools and equipment. Besides increasing the efficiency of both men and machines, Hypressure Jenny steam cleaning exposes lubrication fittings and grease cups, and removes sand and grit which otherwise might enter bearings . . . reveals damaged or worn parts permitting repairs before service failures occur . . . eliminates fire hazards due to the handling of volatile cleaning fluids.

Hypressure Jenny is fast . . . 8 to 10 times faster than hand cleaning . . . thorough . . . economical . . . and so safe and easy to use that ordinary labor can operate it.

Complete details and the address of your nearest Hypressure Jenny dealer are yours for the asking. Write today.

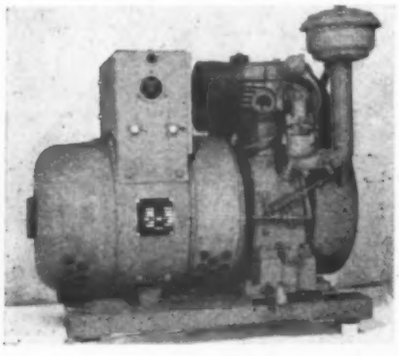
HYPRESSURE JENNY DIVISION
HOMESTEAD VALVE MANUFACTURING CO.
P. O. BOX 32 CORAOPOLIS, PA.

New Construction Equipment and Materials

1

New Lighting Plant

A new Katolight plant model with a capacity of 2,500 watts alternating current, has been added to the line of the Kato Engineering Co., Mankato, Minn. The plant is self-excited, cranks from 24 volts of battery. The DC winding has sufficient capacity to charge a standard 32 volt glass jar type battery. In reality this is a combination AC and DC plant. In many



New Katolight Plant

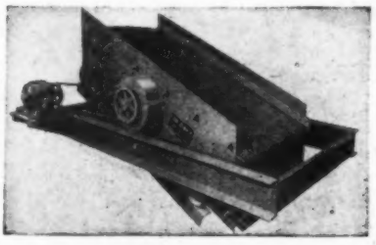
installations it is desirable to operate some devices from a battery. This new Katolight plant is complete with battery charging relays and the charging rate automatically adjusts itself. When the plant is carrying a full AC load, there is very little, if any, DC battery charging. When plant is carrying only a partial AC load, the battery is charged at a proportionally greater rate. It may be furnished with full automatic control or remote control. A voltage regulator holds AC voltage within 5 volts change between no load and full load. The generator is mounted directly on side of engine which is a Briggs & Stratton ZZP, 1-cylinder, 3 in. bore, 3¼ in. stroke, 1800 RPM, oil bath air cleaner, ignition filtered and shielded, sensitive governor, engine generator mounted on welded steel base equipped with rubber vibration absorbers. Available with gravity feed gasoline tank or fuel pump to permit drawing fuel from large under-ground supply tank. Length 28 in., width 20 in., height 26 in., net weight 380 lb.

•

2

New Vibrating Screen

A new vibrating screen to be known as Link-Belt "CA" concentric-action screen has been announced by Link-Belt Co., Chicago, Ill. The new "CA" screen is an inclined floor-mounted or spring-and-cable suspended screen with an ingeniously balanced two-bearing vibrator mechanism which imparts a concentric or circular vibrating motion to all points of the screening surfaces. The screen can be used for both medium and heavy duty sizing as well as for scalping



Floor Mounted Adjustable-Slope "CA" Screen

and dewatering or rinsing operations. It is made with double or triple decks and in sizes ranging from 3 x 8-ft. to 6 x 14-ft. Single-deck screens can be provided by merely removing the lower deck of the standard double-deck screen.

Mail Inserted Card

For data on equipment described on these pages. See also inquiry blank on page 113

3

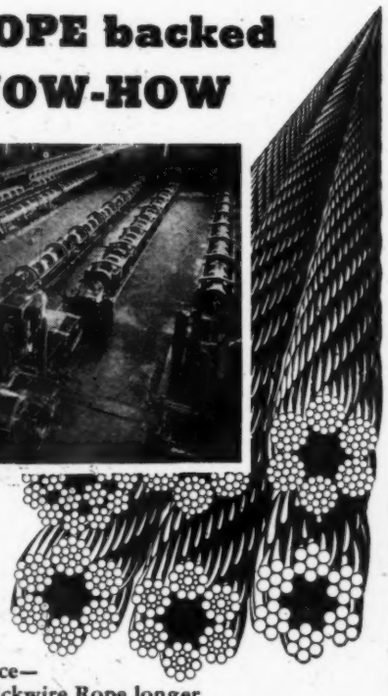
New Radiator Flushing Device

A radiator flushing attachment, announced by White Engineering & Mfg. Co., Inc., 166 W. Passaic St., Rochelle Park, N. J., manufacturers of portable steam cleaning machines, was especially designed for reverse flushing of automobile, truck, tractor and airplane radiators and blocks—using steam and chemicals for accomplishing a thorough cleaning and reconditioning of such cooling systems. This White Radi-Flush, equipped with the proper type of connectors, can be used, the manufacturer states, for any cleaning purpose which requires flushing. It is stated that the White Radi-Flush can be used in conjunction

White Radi-Flush

with a White, or similar type vapor steam cleaning machine. This system of flushing employs the steam generated by the vapor steam cleaner, in which the cleaning compound is mixed. The solution of steam and chemicals in reverse is flushed under controlled pressure until the entire cooling system is completely clear.

Buy the ROPE backed by the KNOW-HOW



Here are a few of the stranding machines in Wickwire Spencer's modern wire rope mill. In principle these machines are not unlike those found in many rope mills. The difference—the thing that makes Wickwire Rope longer lasting—lies in the making of the steel and drawing of the wire used in the rope.

Only steel wire with the highest possible degree of perfection in hardness, strength, toughness and fatigue-resistance is used. And every wire used in making Wickwire Rope is drawn until it's accurate within a fraction of a thousandth of an inch.

Distributors and Wickwire Rope engineers in all parts of the country are prepared to render prompt service in solving your wire rope problems and meeting your wire rope needs. Wickwire Rope is available in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed.

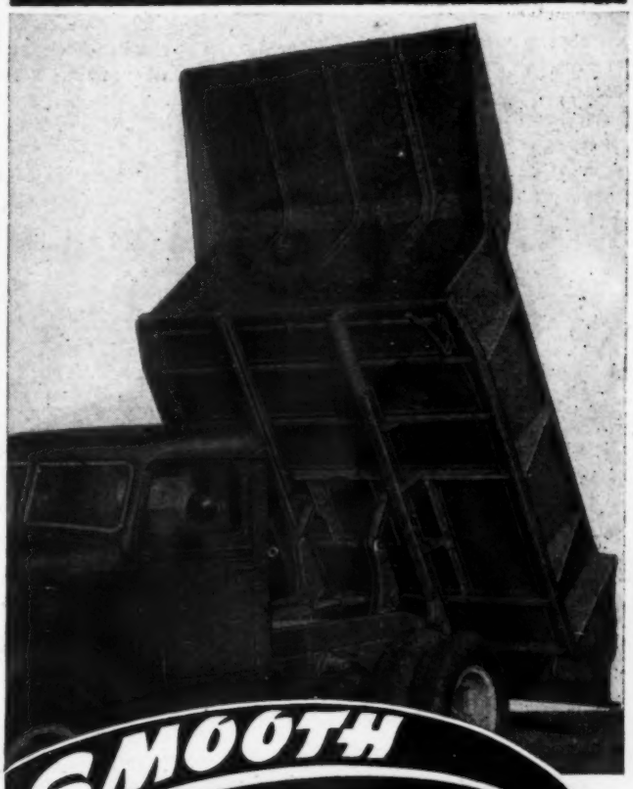
VALUABLE GUIDE FOR ALL ROPE USERS — Thousands of wire rope users have found that the information packed in the 82 pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. This easy-to-read, profusely illustrated manual is free. For your copy write, Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

WICKWIRE ROPE

A PRODUCT OF WICKWIRE SPENCER STEEL DIVISION OF THE COLORADO FUEL AND IRON CORPORATION

WIRE ROPE SALES OFFICE AND PLANT—Palmer, Mass.
GENERAL OFFICE—500 Fifth Avenue, New York 18, New York
SALES OFFICES—Abilene (Tex.) · Boston · Chattanooga · Chicago · Denver Detroit · Philadelphia · Tulsa · Ft. Worth · Houston · Newport News · New York
PACIFIC COAST—The California Wire Cloth Corporation, Oakland 6, Calif.

USED THE WORLD OVER



SMOOTH IS THE WORD FOR PERFECTION BODY and HOIST ACTION

Write for name of nearest Perfection Distributor

THE PERFECTION STEEL BODY COMPANY

GALION, OHIO

PERFECTION STAKE and DUMP BODIES HYDRAULIC HOISTS

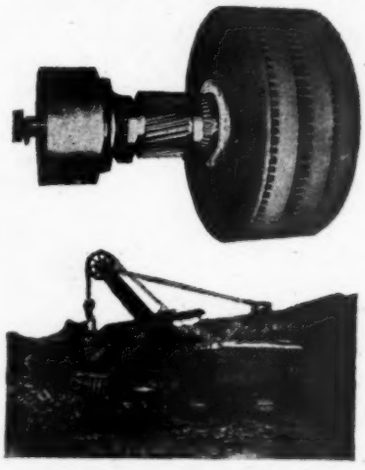
FOR ANY TRUCK STANDARD or SPECIAL UNITS IN ALL SIZES · FOR ANY USE

4
Rayon Conveyor Belt

A conveyor belt with rayon cord plies as a strength member has been announced by Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J. This new belt is designed to meet the needs of mechanized coal and metal mines, quarries and limestone plants for a belt of higher tensile strength for increasing heavy-duty, long-lift conditions. Because of extensive mechanization in mines and quarries in recent years, the trend has been toward longer belts, higher lifts and heavier loads. Advantages claimed are: troughs easily, has virtue of fiber resilience, can utilize conventional type idlers and pulleys, can be field-spliced with conventional methods, permits construction modifications to suit varying service conditions.

5
New Feature on P&H 6-Yd. Shovel

P&H "Magnetorque" hoist drive is now offered as standard equipment on the 6-yd. electric shovel of Harnischfeger Corp., Milwaukee, Wis. "Magnetorque" drive replaces the usual generator and DC motor with a simpler AC motor. Because of the nature of this drive, two concentric electric magnets with one rotating within the other, it is likened by the manufacturer to "fluid drive." The amount of torque to be transmitted is controlled through variable energizing of the magnetic field. Other advantages claimed for this type of control are: elimination of customary hoist generator and its maintenance, smooth



"Magnetorque" Drive Unit and 6-Yd. Shovel

Ward Leonard performance with faster plugging, a reduction in peak power demands and power costs. With P&H "Magnetorque" drive, the customary slip-friction hoist clutch is also eliminated, and shock loads are cushioned.

6
New Clutch Facing Assemblies

Seven new clutch facing and brake lining assemblies have just been announced by The S. K. Wellman Co., Cleveland, O., manufacturers of Velvetouch friction products. Included are steering clutch packs for D2, D4, D6, D7, and D8 tractors, clutch discs and brake band linings for No. 24 and No. 25 cable controls, and master clutch plates for No. 11 and No. 12 motor graders. Featured in each assembly is exclusive Velvetouch all-metal design that is claimed to eliminate oil rot, insure extra service life, minimize repair and adjustment.

Standard Steering Clutch Pack

For resurfacing secondary roads and city streets . . .

ALSO FOR NEW CONSTRUCTION

● Here, for the first time, is a self-contained, single-unit machine which accomplishes the entire mixing and laying job in one continuous operation. The Moto-Paver delivers the mixed material spread and struck off on the road surface, ready for rolling. Paving width is adjustable from 8′6″ to 12′0″, and thickness up to a maximum of 7″. The strike-off blade is adjustable to hold accurately to specified grade and crown.

The Moto-Paver has been successfully operated using gravel, stone or slag aggregates, and with most types of emulsions, RC, MC and SC asphalts and tars. Illustrated bulletin giving complete information and specifications will be sent on request.

HETHERINGTON & BERNER INC., 721 Kentucky Ave., Indianapolis 7, Ind.

H&B Moto-Paver

THE COMPLETE TRAVELING MIXER AND PAVER

SCOOPMOBILE

LOADS • LIFTS • STACKS • HAULS
POURS • SCOOPS • SPREADS

Around the plant or any job where there's material to move, the new power steering SCOOPMOBILE is the best answer. One man and a SCOOPMOBILE can load up to 80 yards of stock-piled sand, gravel, or dirt per hour. Quick change attachments make the SCOOPMOBILE a versatile machine that can efficiently move materials of practically *any* nature. Investigate what a SCOOPMOBILE can do for you.

Write Dep't RS for complete information and name of your nearest SCOOPMOBILE dealer.

TOWS from Job to Job

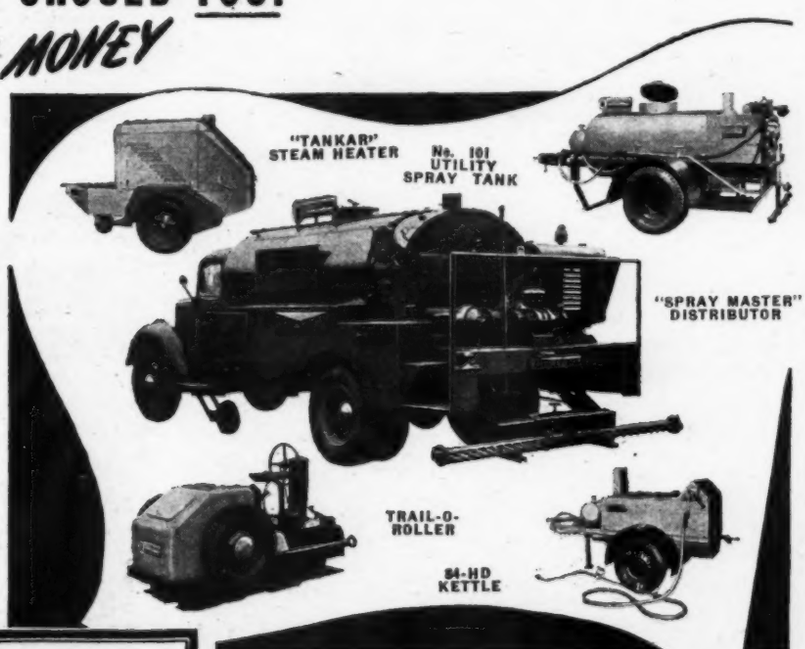
MIXERMOBILE MANUFACTURERS

6855 N. E. HALSEY STREET - PORTLAND 16, OREGON

Roads Must Take a Beating
. . . but WHY SHOULD YOU?

LITTLEFORD SAVES YOU MONEY

Speed and efficiency are built into every unit of equipment that Littleford produces for the construction and maintenance of black top roads. From the big Spray Masters that lay it down in any width up to 24 feet, right through the line to the most inexpensive spray kettles, Littleford equipment moves faster, heats faster, operates faster. For almost fifty years Littleford has engineered and designed simplified units for every function in heating and application. Save yourself some money by getting the facts about the entire Littleford line. Write for Catalog W.



BLACK TOP ROAD MAINTENANCE EQUIPMENT LB SINCE • 1900

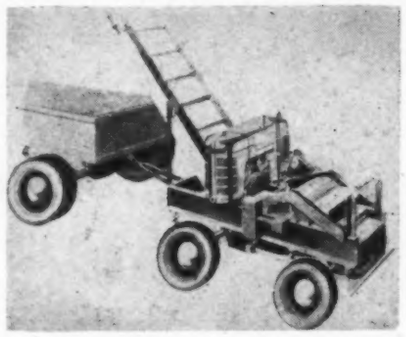
LITTLEFORD

LITTLEFORD BROS., Inc.

454 E. PEARL ST., CINCINNATI 2, OHIO

7
New Brush Cutter

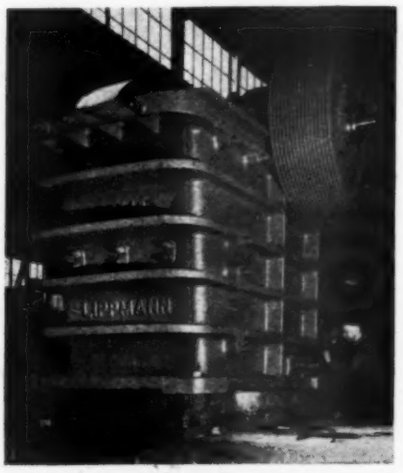
A machine for cutting tree trimmings, brush, fallen timber, and other woody plant waste into chips, has been placed on the market by Mitts & Merrill, Saginaw, Mich. This M & M Brush Hog utilizes 24 revolving knives and 2 stationary bars in reducing brush to chips at the rate of 5,000 to 6,000 lb. per hour. Chips produced may be mixed with coal for boiler or other industrial firing, or may be sold to paper manufacturers or other pulp consumers. The Brush Hog is fully mobile. It is powered by an International gasoline motor, with power feed and V-belt drive.



M & M Brush Hog

8
Large Jaw Crusher

Just completed at Lippmann Engineering Works, Milwaukee, Wis., is what is believed to be the world's largest overhead eccentric jaw crusher, a 36x48, with a hard rock capacity of 210 tons per hour at 3 inch discharge opening. Built for Charles Hoyt, Silverton (Ore.), construction contractor, the complete crusher stands 11′ ½″ high, weighs 84,000 lbs. The movable jaw is 10′ 10″ high, and weighs 35,000 lb. Other data: range of discharge opening—2 to 8 in.; flywheel dimensions—diameter 66 in., face 21 in.; shaft diameters —16 in. at center, 14½ in. at eccentric bearing, 12 in. at main bearing; power requirements—100 to 150 h.p. at 200 r.p.m.



Large Overhead Eccentric Jaw Crusher

9
New Sand Spreader

A new hydraulic road sander is now in production by Hydraulic Engineering Co., Waukesha, Wis. The unit can be attached to the rear of the dump body of any truck with a power take-off. With the body elevated, the sand is carried by an agitator to an opening where it falls onto a rotating distributor that spreads the sand, cinders, other chemicals, or abrasives evenly on the highway. A portion of the sand is thrown ahead of the rear wheels, providing traction even while the highway is being sanded. Being hydraulically driven, the sander can be controlled by the truck driver while the truck is moving on the highway, and the spreader can be started or stopped instantly. Speed of the rotating distributor can be increased or decreased as desired and the amount of sand and the direction in which the sand is to be thrown can be positively controlled.

Transfer of weight alone isn't enough, but when it is combined with 2 large diameter guide rolls, and synchronized steering, the hazard of material displacement is eliminated, and the roller provides that extra smoothness so essential to the best highway and runway construction. These features are found only in Buffalo-Springfield 3-axle tandem rollers. See your Buffalo-Springfield dealer today.

THE STANDARD OF COMPARISON

BUFFALO SPRINGFIELD

SPRINGFIELD, OHIO

Clean Cool DRINKING WATER

Stop GERM SPREADING PRACTICES

PORTABLE SANITARY

MEETS REQUIREMENTS OF PUBLIC HEALTH AUTHORITIES

FOR CONSTRUCTION AND MAINTENANCE CREWS

The Dobbins PORTABLE SANITARY DRINKING FOUNTAIN protects the health and strength of workmen on any job... anywhere... with cool, clean drinking water—at the press of a button! Aids railroad, highway and building construction, repair and maintenance crews... miners, and all other workmen on jobs where a permanent, sanitary drinking water supply is *not* available. Banishes germ-spreading practices such as use of "common" drinking cups, open pails, dippers, etc. Four gallon capacity tank is fully insulated. Air pressure for instant flow of water is supplied with a few strokes of the pump.

DOBBINS MANUFACTURING COMPANY
DEPT. 522, ELKHART, INDIANA

DISTRIBUTORS: Some territories are open for this fast-selling item. Write for complete details.

Dobbins *Superbilt*
PORTABLE DRINKING FOUNTAIN

FOUNTAIN AND ACCESSORIES • • AVAILABLE FOR IMMEDIATE DELIVERY

No. 18 — Dobbins Superbilt *Portable Drinking Fountain* less all accessories. Only **$16.00**

Salt Tablet Dispenser, 500 tablet capacity, extra **$2.75**

Adjustable, Waterproof *Carrying Strap*, extra **$1.15**

Spill Cup, to catch overflow when used indoors **$3.50**

Mounting Bracket, holds fountain to wall or floor of buildings, trucks, tractors, locomotives, etc. . **$4.50**

All prices F. O. B. Elkhart, Indiana. Circular on request.

LIGHTER

STRONGER

WELLMAN
Williams Type BUCKETS

Stronger because they're constructed of **welded rolled steel**... *lighter* because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. ⅜ to 16½ yd. capacity.

SEND FOR BULLETIN

THE WELLMAN ENGINEERING COMPANY
7003 CENTRAL AVENUE CLEVELAND 4, OHIO

10
Production Resumed on CD Tire

General Tire & Rubber Co., Akron, O., has resumed production of its premium C.D. truck line, which had to be discontinued during the 5-year war period because of the standardization of tire building during the emergency. All sizes in this tire line are being produced with the early output being equally divided to General's sales outlets throughout the nation. The improved methods of rubber compounding and tire construction developed during the war period have been utilized in the building of the new C.D. Design and depth of the massive tread have not been changed in the new tire, but it is reported that the development in rubber compounding pioneered by General's technicians makes the tread run longer, gives greater puncture and cut protection. Carcass of the tire, too, has been improved. Extra strength has been added to the body through new methods of construction devised to meet the rigors of warfare and also through the use of cooler-running rayon cord fabrics, protected by General's patented shock absorbing construction.

11
New Pump

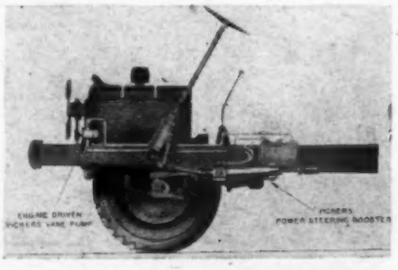
A recent addition to the "MP" line of marine, industrial, and agricultural pumps of the Marine Products Co., Detroit, Mich., is a portable high-pressure pump carrying rubber impellers. This "MP" Duraflex 6600 provides users with the portable features of the Flomax 10 centrifugal pump model now produced, with the additional advantages of a rubber-impelled high-pressure pump. The self-contained power source is a single-cylinder, 4-cycle engine, air-cooled and delivering 5 h. p. The pump is mounted directly to the engine, and power is transmitted through a splined sleeve. The engine has its own crankcase oil supply, eliminating the need for pouring oil into the gasoline. Pump bearings are automatically lubricated by a spring

"MP" Duraflex 6600 Pump

loaded grease cup. Duraflex 6600 is stated to deliver more than 40 gal. per minute at a pressure of 120 lb. per square inch and has a suction lift of over 30 feet. An automatic by-pass valve relieves pressure in excess of 150 P.S.I., and also furnishes manual relief where convenient in handling hoses. This by-pass feature makes it possible to start pumping against a head of water.

12
Hydraulic Power Steering System

Mass production of a redesigned hydraulic power steering system is now under way by Vickers Incorporated, Detroit, Mich. The redesigned booster includes many new features: simplified installation, cost reduced over one-third, 13% lighter weight and more rugged and compact construction. Like previous models for the past 16 years, the redesigned



Vickers Hydraulic Power Steering System

PICK OUT A "TOUGH" JOB . . . .

THEN PICK A GENERAL . . . . . .

. . . . . TO DO THAT JOB

faster . . . . . .

better . . . . . .

cheaper . . . . . .

You know the kind . . . that job on which you've never been able to get production up where you'd like it . . . the one that's been "raising Ned" with your present equipment! That's the kind of a job where a GENERAL really stands out!

You've got a job like that . . . where operating conditions are especially bad . . . where usage is exceptionally severe. The record proves that GENERALS can take punishment, day after day, and still turn in a creditable performance: 98% OF ALL THE GENERAL MACHINES EVER BUILT ARE STILL IN SERVICE! That's a record worth thinking about in planning the purchase of new equipment. It's a record that proves a GENERAL can handle your job—faster, better, cheaper. See your nearest distributor or write to us direct today for the complete details . . . you'll find them both interesting and helpful.

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO. EXCAVATOR

MARION • OHIO

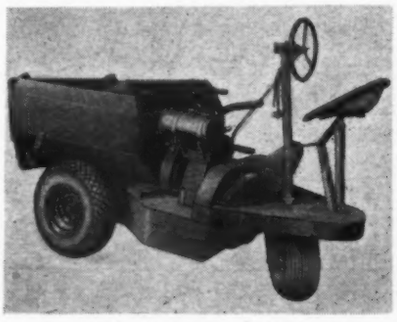
DIESEL GASOLINE OR ELECTRIC POWERED • ¾ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

Vickers steering booster is stated to assure the driver of effortless, positive and shockless steering of vehicle regardless of road obstructions, blowouts, ruts, sand, gravel or crosswinds. Tested and proven on city buses and heavy trucks for almost two years, the Vickers hydraulic steering system is easily adaptable to new and existing designs of buses, trucks, road building and maintenance equipment, and construction and handling machinery.

13
Mechanized Wheelbarrow

A mechanized wheelbarrow, announced by Novo Engine Co., Lansing, Mich., is stated to be capable of carrying a 1-ton load at speeds up to 15 miles per hour.

The unit, which is called Scootruk, is equipped with special airplane type tires, and weighs 1000 lb. Steering is by a single tail wheel, permitting



The Scootruk

easy maneuvering in tight places and enabling it to turn in its own length. Power is supplied by a 6 h.p., air-cooled Novo engine. A 4-speed transmission—and reverse—provides power for grades and speed for straightaways.

14
New Portable Pump

A new gasoline engine-driven pump, now in production by Diesel Pump & Electric Mfg. Co., Glendale, Calif., has only one moving part, a cast bronze impeller with stainless steel shaft, which is directly coupled to the engine crankshaft. This construction is stated to provide a minimum of wearing parts while maintaining a sturdy design which will withstand rough handling and continuous use on almost any job. The engine is a 2-cycle type of advanced design, using all anti-friction bearings, high pressure aluminum die cast alloy, and is the result of extensive war-time development. In addition to the excellent mechanical design, the engine is equipped with a patented scavenging

JACKSON MODEL FS-6A

for THOROUGH, EFFICIENT VIBRATION of CONCRETE

ANYWHERE — ANY TIME on a WIDE VARIETY of JOBS!

With this thoroughly proved, highly dependable engine-driven flexible shaft vibrator you are all set at a moment's notice to do a perfect job of concrete vibrating on a large variety of jobs, and to effect very appreciable labor and cement savings as well as achieving better quality in the finished product.

It is available with four interchangeable heads ranging from 1¾" x 10¾" to 2⅜" x 18⅝"; and since the vibrator speed may be quickly and positively adjusted, size of head and amplitude may be perfectly balanced to suit each type of job. Top frequency is from 7,000 to 7,500 VPM depending upon the length of flexible shaft used and consistency of concrete. Full swivel, dirtproof base. Drop-handle wheelbarrow mounting at small extra cost. Plenty of power is assured by the dependable 4 H.P. Wisconsin engine. Automatic clutch saves engine wear. Flexible shaft is furnished in 7', and 14' lengths up to 28'. Equipped with new and improved reduction pulley for driving grinding heads most efficiently for wet or dry rubbing. See the FS-6A and the other highly efficient JACKSON Vibrators at your JACKSON Distributor or write for complete details. There's a JACKSON to ideally suit every concrete vibrating requirement.

In this view of the Model FS-6A note the two speed pulleys for most efficient shaft speeds for operation of vibrator and grinder heads.

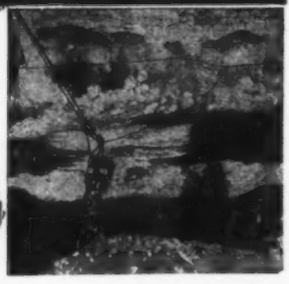
JACKSON Model FS-6A FLEXIBLE SHAFT CONCRETE VIBRATOR

with drop-handle wheelbarrow mounting. Perfectly balanced for easy portability.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

DIG-HAUL-DUMP

for a FEW PENNIES a yard!



Sauerman Scraper moves gravel from pit to crusher. Scraper is equipped with carrier and utilizes gravity for return trip.

Sauerman Slackline Cableway cleans out a clogged up tailrace and hauls tons of rock debris to spoil pile on shore.

SHORT CUT TO EARTHMOVING PROFITS

Time and labor are saved by combining digging, hauling and dumping in a continuous process with one operator. Rapid and dependable handling with *minimum* of cost—as little as 2c a yard covers all operating charges. Sauerman Machines provide wide range of handling capacities and operating spans. Specifications of types and sizes shown in Sauerman catalog. Send for your copy NOW.

SAUERMAN BROS., INC.
588 S. Clinton St. Chicago 7, Illinois

SMOOTH POWER *Two-Cylinder*

The NEW ONAN *AIR-COOLED* 10 H.P. 4 CYCLE "CK" ENGINE

A new, light, compact, easily-installed engine of wide power range. Completely "De Luxe" equipped, easy-to-get-at controls, and many other *plus* points. Prompt delivery on early orders.

ONAN ELECTRIC PLANTS—A.C.—350 to 35,000 watts in standard voltages and frequencies; D.C.—600 to 10,000 watts, 115 and 230 volts. Battery chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts. ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 h.p.; BH: 2-cylinder opposed, 5.5 h.p.; IB: 1-cylinder, 2.5 h.p.

Onan PRODUCTS

WRITE FOR SPECIFICATIONS

- **HEAVY-DUTY CONSTRUCTION:** Short, sturdy crankshaft. Extra-large bearings.
- **SMOOTH POWER:** Opposed 2-cylinder design. Fully counter-balanced crankshaft.
- **SUPER COOLING:** Axial-flow fan delivers 600 cu. ft. of cool air per minute. Larger fin area.
- **ALUMINUM CONSTRUCTION:** High-strength aluminum castings reduce weight.
- **ELECTRIC STARTING AVAILABLE:** Built-in electric push-button or automatic starting.
- **COMPACT, LIGHT WEIGHT:** Fits into 15 x 19 x 18 inch space. Weighs only 97 pounds.

D. W. ONAN & SONS INC.
2819 Royalston Ave. Minneapolis 5, Minn.

ONAN 4-Cycle ENGINES

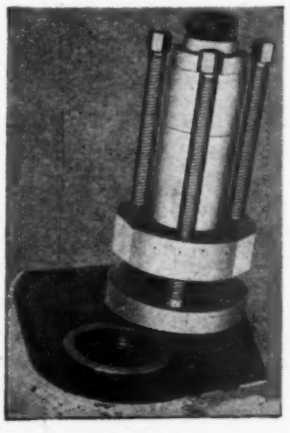
system and is stated to be unusually easy to start by virtue of the scavenging system together with the built-in high tension magneto which utilizes Alnico V permanent magnet material in the magneto rotor. The pumps are available in sizes up to 2000 gal. per hour capacity for deep

The Depco Pump

well service depth; up to 3000 gal. per hour for shallow well service; and up to 4000 gal. per hour for conditions requiring larger volume at lower pressures. In addition, several new models will soon be available, including an unusually light weight portable self-priming contractors type pump with a capacity of more than 6000 gal. per hour.

15
New Tractor Service Tool

A complete set of tools for removing and installing the sprocket shafts and spacers on Allis-Chalmers industrial tractors HD-7, HD-7W, HD-10, HD-10W and HD-14 is now available from the Owatonna Tool Co., 319 Cedar St., Owatonna, Minn. This set of tools was designed and developed with the cooperation of Allis-Chalmers service engineers. The com-



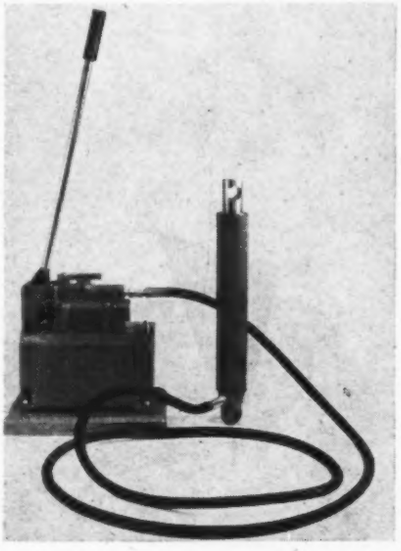
Tractor Service Tool

ponent parts of the set are interchangeable so that sprocket shafts on all the Industrial models can be removed with a minimum number of parts. A separate set of parts are utilized to remove and install the

HD-7W and HD-10W spacers and a set of three protectors is supplied to protect the end of the shaft when installing it in each model.

16
Power Package

A hydraulic unit designed for mounting on most every make of tractor has been placed on the market by Glenn M. Rogers, Buffalo, N. Y. The unit has direct drive from crankshaft and finger tip control from



Power Package

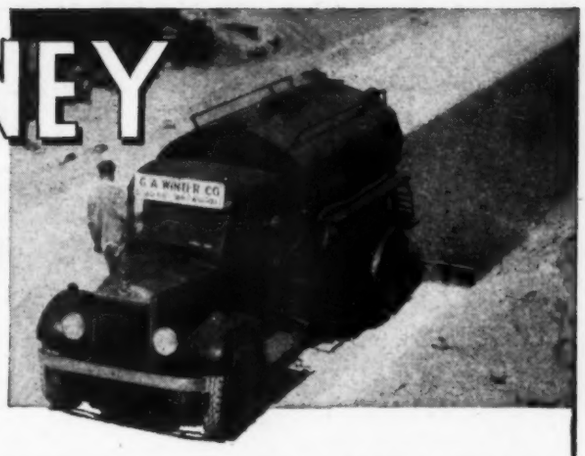
driver's seat. The unit weighs 50 lbs., and will lift over two tons. It consists of a sturdy double action hand hydraulic pump, a 2 in. x 10 in. stroke ram that lifts 10 in. and 12 ft. of hydraulic hose.

17
New Tractor Shovel

In order to meet the popular demand for a medium size Payloader, The Frank G. Hough Co., Libertyville, Ill., has announced the Model HF, a ¾ yd. shovel. Completely new in design, construction and performance, the Model HF Payloader has been thoroughly job tested and is now in production. Built into the Model HF are many new innovations and exclusive features which contribute to higher production and greater economy. A unique 4-speed fully reversible transmission provides practical forward digging speeds plus high reverse maneuvering speeds all quickly available with a minimum of shifting. A single lever shifts gears into the desired speed range—thereafter the operator controls forward or reverse by merely flipping a directional lever. The bucket is raised, lowered,

KINNEY

BITUMINOUS DISTRIBUTORS



FAST ROAD SPEEDS • UNIFORM APPLICATION

Fast and accurate, the KINNEY Distributor handles all grades of bitumen used in road work — tar, asphalt, road oil, cut-back and emulsions — up to 400 g.p.m. It is equipped with the famous KINNEY SD Rotating Plunger Pump, accurate as a meter, and applies material fast in the precise amounts specified by the highway engineers. Throughout the world KINNEY Distributors have a long-established reputation for speed, reliability and accuracy.

Write for Bulletin

KINNEY MANUFACTURING COMPANY

3537 WASHINGTON STREET, BOSTON 30, MASS.

New York • Chicago • Philadelphia • Los Angeles • San Francisco

We also manufacture Vacuum Pumps, Liquid Pumps and Clutches

POWER CERTAINTY

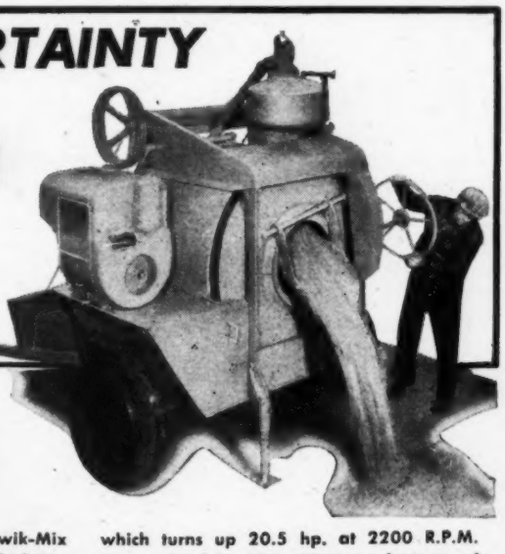
PROVIDED BY

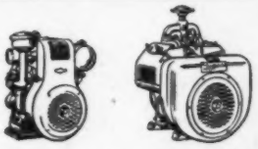
WISCONSIN

HEAVY-DUTY

Air-Cooled

ENGINE





The Kwik-Mix 11-S Dandie, made by Kwik-Mix Company, Port Washington, Wis. (Koehring Subsidiary), not only has a reputation for fast charging, fast discharge and quick remixing . . . but it is also noted for *Power Certainty* . . . the ability to keep on going day after day, in any weather, anywhere. This is a logical result of heavy-duty power delivery by the Model VE-4 (V type, 4 cylinder) Wisconsin Air-Cooled Power Unit which turns up 20.5 hp. at 2200 R.P.M. Incorporated in this engine are features of Heavy-duty design pioneered by Wisconsin . . . assuring maximum serviceability on the job and minimum maintenance costs.

For Power Certainty . . . regardless of the kind of equipment you are using . . . specify "Wisconsin Air-Cooled Engines" . . . for any machine or job within a 2 to 30 hp. range. Descriptive literature on request.

WISCONSIN MOTOR Corporation

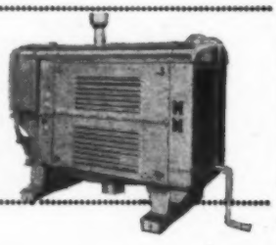
MILWAUKEE 14, WISCONSIN

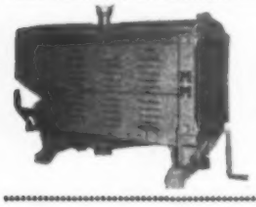
World's Largest Builders of Heavy Duty Air-Cooled Engines

Look to MM for
POWER, ECONOMY, AND EFFICIENCY
IN STATIONARY POWER AS WELL AS INDUSTRIAL TRACTORS

Model 165-4A 3⅜" x 4"—4 Cylinder 26 H.P. at 1500 RPM Burning Gasoline. 165 cu. in. displacement. Wt.: 1060 lbs. Model 206A-4A 3⅜" x 5"—4 Cyl. 38 H.P. at 1500 RPM Burning Gasoline. 206 cu. in. displacement. Wt.: 1080 lbs.

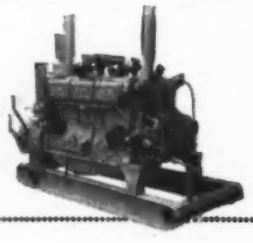
Model 283-4A 4¼" x 5"—4 Cylinder 52 H.P. at 1400 RPM Burning Gasoline. 283 cu. in. displacement. Wt.: 1850 lbs. Model 403-4A 4⅜" x 6"—4 Cylinder 64 H.P. at 1200 RPM Burning Gasoline. 403 cu. in. displacement. Wt.: 1950 lbs.

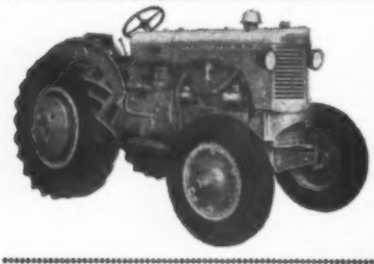




Model HUA 4⅜" x 6"—6 Cylinder 94 H.P. at 1200 RPM Burning Gasoline. 605 cu. in. displacement. Wt.: 3000 lbs.

Model 1210-12A 4⅜" x 6"—12 Cylinder 206 H.P. at 1400 RPM Burning Butane Gas. 1210 cu. in. displacement.





Model UTI Industrial Tractor 49 H.P. 126" Overall Length. 76" Overall Width. 16' Turning Radius.

Model RTI Industrial Tractor 27 H.P. 104" Overall Length. 59" Overall Width. 12' Turning Radius.

See Your Nearest MM Dealer—Distributor Or Write

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

dumped and relatched by hydraulic power, controlled by a single lever. Bucket may be dumped completely or gradually at any height.

Model HF Payloader

18
New Tire Demounter

A new tire demounter, known as Presto Model B-1, has been placed on the market by Lee Engineering Co., Pawtucket, R. I. This manually operated unit incorporates the rugged Simplex-Jenny center-hole hydraulic jack which develops over 60,000 lb. pulling pressure. The demounter removes the most stubborn tire without injury to tire tube, wheel or rim and may be operated to capacity by a boy. It is quickly adjustable to demount any size tire from 7.00-15 to 24.00-24 on trucks, buses and heavy vehicles. Construction is entirely of steel, light in weight, but extremely strong. The Presto B-1 demounter is portable—it does not require any source of electricity or air and is ready for instant use anywhere.

Presto B-1 Demounter

19
New Bituminous Transport Tank

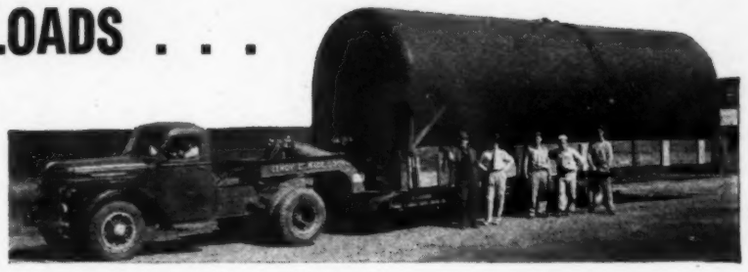
Designed for use with traveling mixing plants a 1,500 gal. single compartment portable supply tank is

SAFE FOR UNUSUAL LOADS . . .

It takes a sturdy, well designed and properly constructed trailer to safely transport unusual and unbalanced loads. Heavy hauling is ALWAYS SAFE with a JAHN TRAILER.

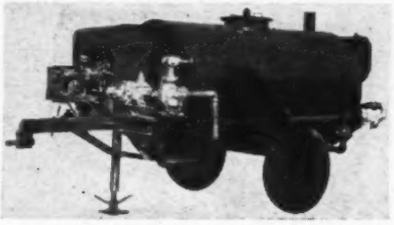
JAHN TRAILERS ALL OVER the WORLD!

Reg. Trade-Mark



Heavy duty trailers from 5 to 100 tons with any wheel or axle combination.

C. R. JAHN COMPANY
1345 WEST 37th PLACE, CHICAGO 9, ILL.



Left front view of Wood Supply Tank showing hitch and jack, Ingersoll-Rand Compressor for heating burner, and Chrysler industrial engine which drives compressor and Roper Pump. Burner flue and burner fuel tank are seen at rear

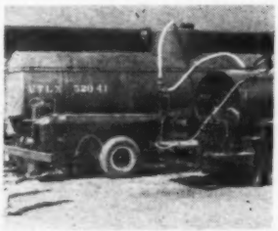
now in production by Wood Manufacturing Co., North Hollywood, Calif. A 3 in. Roper pump powered by a Chrysler industrial engine is mounted at the front of the tank. This pump is used for loading the tank, transferring bituminous fluids from tank to travel plant, and for circulating fluids within the tank while heating. Tank is available without insulation or heating equipment, or with heating equipment only. A 24 in. manhole allows entrance for cleaning.

20
New 2-Wheel Scraper

A new 2-wheel hydraulic scraper designed for high-speed use with large wheel tractors is now being manufactured by American Tractor Equipment Corp., Oakland, Calif. This new scraper is made in 3 sizes—H52 (4.5 heaped yd.); H62 (5.6 heaped yd.); and H72 (6.9 heaped yd.)—for International 19, Oliver 900, and other heavy-duty wheel tractors. Like other ATECO scraper models, these

THE QUICKEST WAY TO HEAT THE COLDEST CAR OF ASPHALT . . .

GRACE CIRCULATING TANK CAR HEATERS

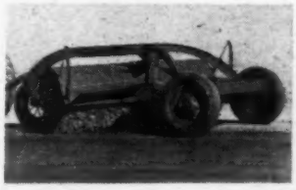


Made for Tank Cars . . . will unload asphalt at 250 GPM. Heats 10,000 gal. insulated car 50° or more per hour. Will trail to the job at 40 MPH.

FOR EVERY SWEEPING JOB . . .

GRACE SWEEPERS

For cleaning road base before asphalting, sweeping streets, or for airfields. Available in axle-driven, motor-driven, or front end of tractor types.



WRITE TODAY FOR DETAILS

W. E. GRACE MFG. CO.
6005 S. Lamar St. *Dallas, Texas*

TUTHILL GUARD RAILS

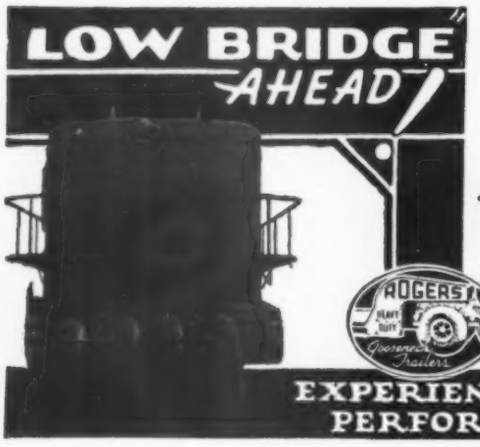
SAFETY APPEARANCE VISIBILITY

TUTHILL GUARD, with its convex surface and spring brackets, is safer, for two reasons. It can be seen quicker at longer distances. Its deflective action deflects cars back into highway and absorbs impact. Result—more lives saved—less damage to car and guard rail. Low upkeep cost.

Pacific Coast Distributors and Manufacturers:
U. S. SPRING & BUMPER CO.,
Los Angeles, Calif.

Request Details.

TUTHILL SPRING CO.
761 W. POLK ST., CHICAGO 7, ILL.



the answer to that problem is this

ROGERS GIRDER-TYPE TRAILER

Rogers builds trailers for unusual needs, embodying characteristic features of fundamental design, but modified to meet special requirements. With a Rogers Girder Type Trailer there is slight chance of being confronted with a headroom clearance problem. Special construction affords an unusually low bed.

ROGERS BROTHERS CORPORATION
110 ORCHARD ST. ALBION, PA.

new models for wheel tractors have a low center of gravity, independent front apron, and a rear apron that wipes the scraper bowl sides clean as load is dumped. The simple yoke design and absence of overhead structure give the operator a good view of his work from the tractor seat. A special hitch assembly eliminates the front trucks of the scraper and enables the pulling tractor to carry part of the scraper load. Cutting edge width for the H72 is 8 ft. 6 in.; for the H62, 7 ft. 0 in., and for the H52, 6 ft. 4 in. The scrapers, with hitch assembly, weigh approximately 8,490 lbs. for 6.9 yd. size; 6,540 lb. for 5.6 yd. size; and 5680 lb. for 4.5 yd size. Scrapers may be had either dual or single tires. Front truck essembly may be added so scraper can be operated in conventional manner with either crawler or wheel tractors.

New 2-Wheel Hydraulic Scraper

DOWEL ALIGNMENT BEING CHECKED BY SPIRIT LEVEL

HIGHWAY DEPARTMENTS REQUIRE DOWEL ALIGNMENT CHECKED BEFORE CONCRETE PLACING.

LACLEDE DOWEL SPACERS ALIGN DOWELS HORIZONTALLY, AND VERTICALLY ON ALL TYPES OF SUBGRADES AND MAINTAINS EXACT ALIGNMENT DURING CONCRETE POURING.

ELIMINATE COSTLY FIELD ADJUSTMENTS—USE LACLEDE DOWEL SPACERS.

LACLEDE STEEL COMPANY

ST. LOUIS, MISSOURI

MANUFACTURERS' LITERATURE

21

"Caterpillar" Progress

The evolution of Caterpillar Tractor Co. and its products progress achieved to date and plans for future progress, are outlined in a newly published 12-page booklet titled *"Caterpillar" Progress Through the Years.* Graphically illustrated the booklet reviews the birth of heavy machinery and traces the patient strides taken to present today's efficient and productive equipment—developments which provide knowledge and experience toward meeting problems of the future.

22

Lumber Research

Research facilities for the lumber and wood using industries and other industrial users of wood are described in a new publication released by the Timber Engineering Co., Washington, D. C. an affiliate of the National Lumber Manufacturers' Association. The booklet outlines the company's laboratory facilities and gives a partial listing of 25 different fields of research carried on for individual companies and trade associations.

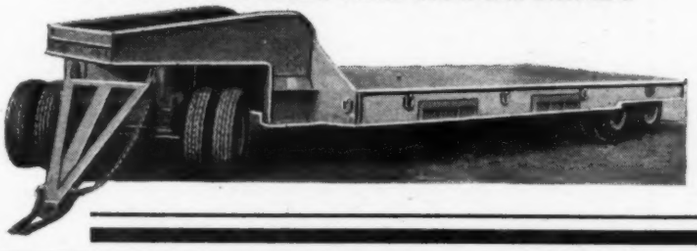
23

Bulk Cement Conveying

A bulletin issued by Fuller Co., Catasauqua, Pa., illustrates and describes the uses of Fuller equipment for handling bucket cement. It contains diagrams of layouts for conveying the bulk cement from hopper

HUGHES TRAILERS
GIVE UNLIMITED PERFORMANCE—

FOR HEAVY ROADS AND ROUGH ROADS



- Hughes Trailers have a capacity rating of from 15 to 100 tons.
- Hughes Trailers can be had in semi or full trailers with drop or straight deck.

L. J. HUGHES CO.
1029 Brooke Blvd. Reading, Pa.

cars or box cars as well as for various other cement handling problems. Details of construction and operation of the Fuller-Kinyon Type H. stationary pump are illustrated and described. Illustrations and descriptive matter on long distance cement conveying (7,600 ft. in one instance), with Fuller-Kinyon systems are given.

24
Tractors

Two folders, describing the power and work features of the new "Caterpillar" Diesel D6 and D4 tractors, have been published by Caterpillar Tractor Co., Peoria, Ill. Outlining the design and manufacturing features which have brought increased power to the two tractors and increased earning capacity to users, the folders include specifications of the machines and graphic illustrations of their physical makeup.

25
Permacote Asphalt

A booklet on its new asphalt, permacote, just issued by The Berry Asphalt Co., Chicago, Ill., was written from the point of view of both engineer and contractor. It contains material that is highly technical, as well as explanatory matter about numerous advantages claimed for the asphalt. The booklet is lithographed in two colors and is profusely illustrated with charts and graphs.

26
Valve Reference Chart

A new, 20-page valve cross reference chart has been released by The Ohio Injector Co. of Wadsworth, O. The booklet contains a complete listing of OIC valve numbers in order, with their description.

In
CLEVELAND
IT'S THE
HOLLENDEN

1000 ROOMS WITH BATH
RADIO IN EVERY ROOM
SIX FINE RESTAURANTS
CENTRAL DOWNTOWN LOCATION
GARAGE ATTACHED

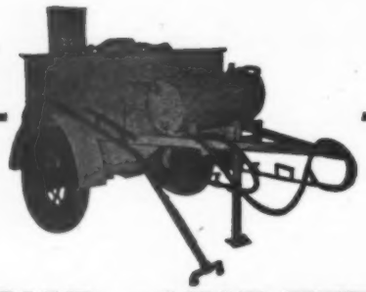
JAMES J. FITZPATRICK
GENERAL MANAGER

MAKES THE SMALL ASPHALT JOBS *Profitable*

• Centrifugal force of revolving drum holds material against inside drum face. Linear travel stores up kinetic energy to do the work of mixing. Energy converter blade (see diagram) peels a stream of material off drum face, slowing speed of material, and creating powerful mixing action. Cross-mixing blades cause side-to-side mixing action. Asphalt is sprayed into material beyond converter blade in metered amounts—up to 8 gallons in 6 seconds. Every particle of aggregate gets complete, uniform asphalt coating—fast. Capacity 3 cu. ft. in 30 seconds! Ask your Foote Dealer for details or write direct for Bulletin K-100.

THE FOOTE CO., INC.
1936 STATE STREET
NUNDA, N. Y.
See Page 23

The **FOOTE** *Kinetic* **mixer**



ASPHALT and TAR KETTLES

FIRE PROOF—OIL BURNING
Hand and Motor Driven spray.
Many sizes. Write for catalog.

Elkhart White Mfg. Co. Indiana

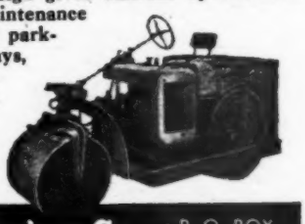
Try a **Pierce-Bear** *on that tough job!*

3½ TON — VARIABLE WEIGHTS

Engineered refinements and rugged strength have earned for these rollers enviable performance records. Compact design gives efficient operation in close quarters. Ideal for maintenance work on highways, airports and parking areas. Fine for driveways, docks, etc. Easy to operate. They do a good job at low cost.

Write for New Illustrated Folder.

MANUFACTURED BY



Lewis Manufacturing Co. P. O. BOX 500
SAN ANTONIO 6, TEXAS

WITH THE MANUFACTURERS & DISTRIBUTORS

Personnel Changes P.C.A.

A. B. Stall was elected treasurer of the Portland Cement Association and Edward F. MacArthur was named assistant treasurer at a recent meeting of the Association's Board of Directors in New York. Mr. Stall succeeds Frank L. Page, veteran treasurer who retired April 30. Mr. MacArthur succeeds to the post held by Stall since 1941.

New FWD Distributors

Studer Tractor & Equipment Co., Casper, Wyo., has been appointed FWD distributor for Wyoming. M. B. Salisbury Co., Inc., Topeka, Kan., has been appointed FWD distributor for that portion of Kansas east of and including the counties of Republic, Cloud, Clay, Geary, Lyon, Coffey, Allen, Neosho and Labette.

Timken Opens Canadian Plant

A new branch plant of the Timken Roller Bearing Co., Canton, O., was formally opened May 23 in St. Thomas, Ontario, Canada. In expanding its operations to Canada, the Timken Co. is seeking to offer better services to present and prospective customers in the Canadian markets. The plant now has a roster of 225 employees, of which some 30 are supervisory personnel who were in the Canton bearing factory for several months learning operating methods and policies. The supervisory list includes: John Jolly, general manager; Charles Wynn, assistant general manager; Jack McGinnis, production superintendent.

Benson Elected Director

James S. Benson, general manager, Chicago Construction Equipment Co., 13912 S. Halsted St., Chicago, Ill., has been elected to the Board of Directors. Mr. Benson was recently released from the Corps of Engineers as a Lt. Colonel, after serving almost five years.

Personnel Changes in Rogers Bros. Corp.

Louis Rogers, president of Rogers Brothers Corporation, Albion, Penn., has announced important changes in its top organization personnel. Harrison J. Rogers has been elected vice president and general manager. He will also continue to function as sales manager, a position which he has held for several years. Other important appointments include that of Leo Brennan as controller and assistant secretary and Paul Sheehan as purchasing agent.

Appointed Sales Manager

H. Cliff Corwin has been appointed sales manager of White Engineering & Mfg. Co., Rochelle Park, N. J., manufacturers of White portable vapor steam cleaning machines. Mr. Corwin was formerly assistant sales manager of Manley Division, American Chain Co., York, Penn. Prior to this, he has had considerable experience in the automotive field. In his new work, Mr. Corwin will supervise the setting up of distribution channels for the White Steam Cleaners in the contracting, automotive, and aviation fields.

RELIANCE

CRUSHING, SCREENING and WASHING UNITS

● Up to 2000 Tons a Day ●

Crushers, Elevators, Sweepers, Screens, Wash Boxes, Bins, Pulverizers, Feeders, Spreaders, Kettles, Conveyors, Drag-Lines, "GAYCO", Centrifugal Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd. 140 Canada Cement Co., Montreal, Que., Can.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

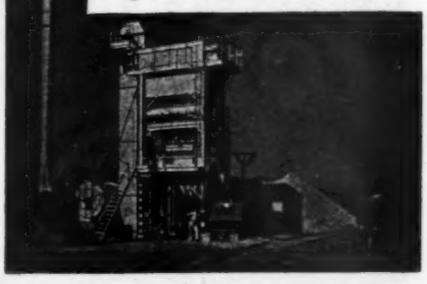
ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan Illustrated CATALOG today.

TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

PORTABLE ASPHALT PLANTS
High Production—Low Cost



THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

Owen SELLS "IN-BUILT" PERFORMANCE

Distinctive Digging Features . . . . .

Deep penetration by bucket teeth—Balance maintained during digging—Undiminished closing power—Shells closed with maximum leverage—Adjustable closing speed—Easy complete discharge.

Durability . . . . . with Long Life

Rigid shell construction—High carbon alloy steel teeth—Dropping shocks absorbed by Owen patented stops—Sealed grit-proof center shaft bearings—Protected cables and sheaves—Lever type arm bracket exert maximum leverage in forcing shells into the material.

THE OWEN BUCKET CO.
6070 BREAKWATER AVE., CLEVELAND, O.

BRANCHES: NEW YORK, PHILADELPHIA, CHICAGO, BERKELEY, CALIF.

A MOUTHFUL AT EVERY BITE

LeTourneau Gets A.B.P. Award

Associated Business Papers has awarded first place for outstanding achievement in industrial advertising to R. G. LeTourneau, Inc., Peoria, Ill. The firm was given this top recognition in the machinery equipment division of A.B.P.'s 5th Annual Advertising Competition. Presentation of the award, a sterling silver plaque, was made to Eugene E. Weyeneth, LeTourneau Customer Relations Manager, during the annual A.B.P. award dinner, held May 12 at Chicago's Drake Hotel. A total of 912 campaigns were entered in the 7-division competition, in which 7 silver plaques were awarded and 37 certificates of merit given. Other top divisional winners included U. S. Steel Corp., Dupont, G. M. Laboratories, Waldes Kohinoor, Inc., Pittsburgh Plate Glass and National Confectioners Association. Entries submitted consisted of 3 advertisements typical of an entire campaign, and were judged on 3 points —adequately informative copy; pertinent illustration; and efficient use of space. A similar plaque was presented to the Andrews Agency, Milwaukee, Wis., which handles the LeTourneau account. The sterling plaque award climaxes consistent recognition accorded the LeTourneau Co., which two times previously has received A.B.P. awards of merit, and two from National Industrial Advertisers Association. The Associated Business Papers use the winning ad campaigns in country-wide advertising clinics to promote more effective methods of business paper advertising.

Gen. Minton Joins Koppers

Brig. Gen. Hugh C. Minton will become production manager of Koppers Co., Inc., on July 1. In his new position, General Minton will report directly to General Brehon Somerville, president of Koppers, thereby re-establishing in civilian life a relationship set up in wartime when General Somerville was Commanding General of the Army Service Forces.

Appointed National Distributor

Dravo-Doyle Co., Pittsburgh, Pa., has been appointed national distributors for the Hercules Turn-O-Matic cement box of Hercules Steel Products Corporation, Galion, O.

ARIENS AGGMIXER

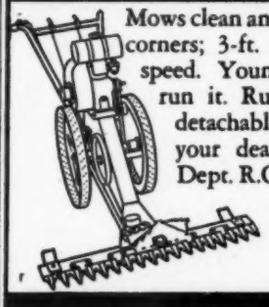
FOR SECONDARY ROAD CONSTRUCTION

The swirling, chopping action of these tines does a thorough job of mixing, wet or dry.

Here's equipment designed especially for mixed-in-place construction — to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate . . . adjustable to any tractor . . . made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY
BRILLION, WIS.

CUNNINGHAM MOWER



Mows clean and fast in tight corners; 3-ft. cut; variable speed. Young folks can run it. Rugged design, detachable engine. See your dealer or write Dept. R.O.

Fence Rows • Roadsides • Railroads • Farm Lawns

JAMES CUNNINGHAM, SON & CO.
13 Canal Street, Rochester 8, N. Y. Est. 1838

Here's The Brake You've Been Waiting For-

OFFERING THESE FEATURES:

- 12½" x 6" braking area
- ¾" bolt on lining
- Constant Rise "S" Cams
- Nickel Cast Iron brake drums

Dealers in 48 States.

HEAVY DUTY LA CROSSE TRAILER CORPORATION

LA CROSSE, WISCONSIN U. S. A.

CLEARING HOUSE

Help Wanted

WANTED AT ONCE

30 Civil Engineers
All Grades

For Highway Location, Design and Construction

With or Without Experience

Permanent Positions as Instrumentmen, Inspectors, Project Engineers, Resident Engineers

Opportunity for location in western state that has excellent prospects for rapid development.

Give age, experience, education.

M. P. WYNKOOP
Chief Engineer
State Highway Department
Bismarck, North Dakota

For Sale

30—10,000 GAL. CAP. R. R. TANK CAR TANKS. CLEANED, TESTED, PAINTED. READY TO SHIP. ATTRACTIVE PRICES. DEALERS PROTECTED.

Telephone Bryn Mawr 1769

L. M. Stanhope

ROSEMONT **PENNA.**

CATERPILLAR REPAIR PARTS

New, diversified assortments, all boxed and each part identified with factory number; several separate lots available; these lots range from $2,000.00 to $8,000.00 each. Parts are priced at aproximately 50% discount. Immediate shipment from Louisville stock. Sold only by lots.

W. W. RENTAL EQUIPMENT CO.
1212 Kentucky Home Life Bldg.
Phone Jackson 2674
Louisville 2, Kentucky

For Sale

FOR SALE

3-ton tandem Pierce Bear Roller, 1946 model, used less than 3 months, perfect operating condition. Price $2,250.00 FOB Cleveland, Ohio.

ROBERT M. DEBEVEC
2010 E. 226th St. **Euclid 17, Ohio**

FOR SALE

1—Heavy Duty Blaw-Knox Clam Shell No. 68—One Yard Capacity.

1—Heavy Duty Blaw-Knox Clam Shell No. 703—1½ Yard Capacity.

These clam shells are located approximately twenty-five (25) miles from Birmingham, Alabama, and may be inspected at any time. If interested, please communicate with

M. W. HUTCHINS
DE BARDELEBEN COAL CORP.
2201 First Ave. **Birmingham 3, Ala.**

FOR SALE OR RENT

LeTourneau Scrapers—all sizes.
LeTourneau Double Drum Sheepfoot Roller.
Air Compressors, 60—105—210.
Air Tools—all kinds.
Link Belt YC9 Cargo Crane.
5- to 8-ton Tandem Rollers.
8- to 12-ton Tandem Rollers.
LeTourneau D4 Tournapulls.
Wiley Model F Stiffleg Derrick.
Electric Sets—1½ KW—5 KW—10 KW.
Centrifugal Pumps, 1½"—2"—3".
J. W. Stang Well Point System.

WATKINS ALDRIDGE EQUIPMENT CO.
JACKSON, MISS.

FOR SALE

1—Iroquois Asphalt Plant with 3000# box (shows no wear)	$14,000.00
1—Huber 10-ton, 3-wheel roller, gas	900.00
1—Kelly-Springfield 5-ton, 3-wheel roller with scarifier	900.00
2—Bull Clam Drotts (new) both for	700.00
1—Galion 10-ton, 3-wheel roller with 24" wheels	4,000.00
5—Galion tandem rollers (various weights and prices).	
1—P & H Crane, Model 200, Serial #1865	3,500.00
1—P & H Crane, Model 450, Serial #4116X	6,000.00
3—Kelly-Springfield steam rollers, two 8-ton, one 10-ton (various prices.)	

PHIL H. McGUIRE
P. O. Box 6055, Milan Station, Norfolk 8, Va.

For Sale

FOR SALE

Diamond Crushing and Screening Plant. Portable. Tandem dual rear, dolly front. 10"x24" roller-bearing crusher. 3'x6' vibrator screen. 24" belts. Price: $6,500.00.

Crane—Sargent Junior ¾ yard. 40' Boob. Price: $6,000.00.

Water Pump—6" Gorman Rupp. Price: $600.00.

Water Pump—4" Gorman Rupp. Price: $400.00.

Two Complete Field Lighting Systems with 110/220 volt AC, for 32 volt system, generator, power take-off type. New condition. Lights, control panel, cables, etc. Price: $500.00.

Two oil or gasoline transport tanks, 1,000 gallon single compartment. Complete with power take-off pumps, dual metering equipment, reels, hoses, etc. Excellent condition. Price: $500.00.

Power Unit—UD 9 International Diesel. New Condition. Price: $1,100.00.

HI-WAY CONSTRUCTION COMPANY
EARLY, IOWA
Phone: R. B. Evans

TRANSITS and LEVELS

New or Rebuilt

Sale or Rent

Headquarters for REPAIRS—any make. Factory service. We will also *buy* your old instruments or take them in *trade*.

A complete line of engineering Instruments and Equipment for Field or Office. Write for Bulletin RS-116.

WARREN-KNIGHT CO.

Manufacturers of Sterling Transits and Levels
136 N. 12th St. **Philadelphia 7, Penna.**

FOR SALE

One 1946 Super C Tournapull. Has been used 350 hr. One new LeTourneau D8 Power Control Unit. Priced right. Located near Ocheyedan, Iowa.

GUS OSTERMANN & SONS
OCHEYEDAN, IOWA

Inquiry Blank and Advertisers' Index

Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

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American Bosch Corp..... 71
American Cable Division.....Third Cover
*Ariens Co. 111

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*Bethlehem Steel Co..... 1
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Check other products below on which you wish us to obtain information for you:

AGGREGATE:
- ☐ Bins and Hoppers
- ☐ Conveyors
- ☐ Crushers
- ☐ Portable Plants
- ☐ Screens

BITUMINOUS:
- ☐ Batchers
- ☐ Finishers
- ☐ Distributors
- ☐ Dryers
- ☐ Heaters
- ☐ Plants (central)
- ☐ Plants (travel)

CONCRETE:
- ☐ Batchers
- ☐ Buggies and Carts
- ☐ Finishers
- ☐ Joints, Expansion and Contraction
- ☐ Reinforcement Accessories
- ☐ Metal Road Accessories
- ☐ Mixers (under 1 yd.)
- ☐ Mixers (1 yd. up)
- ☐ Pavers
- ☐ Reinforcing Steel
- ☐ Road Forms (1000' set)
- ☐ Tower
- ☐ Truck Mixers

CRANES:
- ☐ Crawler Mounted
- ☐ Truck Mounted
- ☐ Piledrivers

GRADERS:
- ☐ Blade, self propelled
- ☐ Blade, pull type
- ☐ Blade, under truck
- ☐ Elevating

LOADERS & TRENCHERS:
- ☐ Front-end loader (tractor mounted)
- ☐ Loader, bucket type and belt type
- ☐ Trencher or Ditcher

HAULING EQUIPMENT:
- ☐ Dump Trucks, self-powered
- ☐ Dump Wagons, tractor drawn
- ☐ Flatbed Trailers
- ☐ Other Trucks

PUMPS:
- ☐ Centrifugal
- ☐ Concrete
- ☐ Diaphragm
- ☐ Mud Jacking
- ☐ Piston
- ☐ Wellpoint

POWER UNIT: (Independent)
- ☐ Gasoline
- ☐ Diesel
- ☐ Electric

ROLLERS:
- ☐ Power (Smooth)
- ☐ Pneumatic Tire
- ☐ Sheepsfoot

TRACTORS:
- ☐ Crawler
- ☐ Rubber-Tired

TRACTOR EQUIPMENT:
- ☐ Dozers
- ☐ Power Control Units
- ☐ Rippers
- ☐ Scrapers, tractor drawn
- ☐ Scrapers, self-powered

BUCKETS:
- ☐ Clamshell
- ☐ Concrete
- ☐ Dragline
- ☐ Orange Peel

SHOVELS & DRAGLINES:
- ☐ Crawler (under 1 yd.)
- ☐ Crawler (1 yd. up)
- ☐ Truck Mounted

ROCK DRILLS & AIR TOOLS:
- ☐ Air Compressors
- ☐ Backfill Tampers
- ☐ Clay Diggers
- ☐ Concrete Vibrators
- ☐ Drills, cabel tool
- ☐ Drills, tripod and wagon
- ☐ Drills, rock, hand-held
- ☐ Paint Sprayers
- ☐ Paving Breakers
- ☐ Riveters and Chippers

MISCELLANEOUS:
- ☐ Buildings, portable
- ☐ Earth Drills, power
- ☐ Light Plants
- ☐ Lubrication, Service Truck
- ☐ Mowers, Highway
- ☐ Power Saws
- ☐ Soil Stabilizing Equipment
- ☐ Snowplows, rotary
- ☐ Snowplows, v or wing
- ☐ Spreaders, sand or cinders
- ☐ Street Flushers
- ☐ Street Sweepers
- ☐ Welders
- ☐ Cutting Torches
- ☐ Hydraulic Jacks
- ☐ Hydraulic Control Equipment
- ☐ Hand Tools
- ☐ Hoists, derrick type

Be sure to fill in name and address below:

Your Name.....Title or profession.....

Name of your company or governmental department.....

Type of work for which equipment will be used.....

Street Address.....

City ..... State ..... County .....

STRONG, DURABLE SAFE... *for Outdoor or Indoor Service*

"AIR KING"

Quick-Acting, Universal Type

HOSE COUPLING

With Auxiliary Locking Arrangement

The most adaptable air hose coupling of its kind, combining quick action with superior strength and safety. Made of malleable iron (cadmium plated) or brass. Shanks of hose ends are long, amply corrugated and smoothly finished, permitting easy insertion in the hose and providing a tight grip under clamp pressure. Plain design and construction—no parts to foul up or get out of order.

I.P.T. Male End I.P.T. Female End

Locking heads are identical for all sizes of hose or threaded pipe ends, making it possible to couple any two sizes of hose, or hose and pipe, of "Air King" dimensions, without adapters, bushings or other extra fittings. Hose ends, 3/8", 1/2", 5/8", 3/4", and 1". Pipe ends, 1/4", 3/8", 1/2", 3/4", and 1".

PATENTED LOCKING ARRANGEMENT

A cotter pin, nail or wire inserted through holes in flanges on locking heads, after connection is made, will prevent the coupling from coming apart regardless of how it is handled.

OTHER DIXON AIR HOSE COUPLINGS include the "DIX-LOCK," a quick-acting, streamlined coupling with renewable sleeve and spring; "G J-Boss" and "G J-Dixon" ground joint air hammer couplings; "Boss" and "Dixon" washer type air hammer couplings.

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